Wayne County Employees' Retirement System

5-Year Experience Study

October 1, 2015 through September 30, 2020

Actuarial Investigation Report
October 1, 2015-September 30, 2020

TABLE OF CONTENTS

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August 24, 2021

Retirement Commission (Board)
Wayne County Employees' Retirement System
Detroit, Michigan

Dear Commission Members:

As requested, we have prepared the results of the 5-year experience study from October 1, 2015 through September 30, 2020 for the Wayne County Employees' Retirement System (WCERS), including the Wayne County Airport Authority. This is one of multiple documents comprising the experience study. The other document comprising the experience study is the PowerPoint presented to the Board on August 30, 2021.

Present Assumptions: The present actuarial assumptions and methods are the same as those used in the Actuarial Valuations as of September 30, 2020 as presented in our reports dated May 14, 2021. We have reviewed all of the current assumptions and are recommending an update to some of the demographic assumptions. We also strongly recommend that the 7.25% investment return assumption be lowered.

Proposed Assumptions: We have reviewed all of the assumptions and are recommending updates to the following demographic assumptions: withdrawal; retirement; and mortality. We are also recommending an update to the merit and longevity pay increases. Furthermore, our assessment, which takes into account the views of your investment consultant, leads to an estimated median investment return assumption of 5.75% over the next ten years. We believe that the investment return assumption should be moved in the direction of the estimated median, although not necessarily all the way.

Unless stated otherwise, the actuarial assumptions that result from this study produce results which, individually and in the aggregate, are reasonable for the purposes of the actuarial valuation.

Summary of Findings
The impact of the new assumptions is shown in Section B.

Risks Associated with Measuring the Accrued Liability and Actuarially Determined Contribution
The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions due to changing conditions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period, or additional cost or contribution requirements based on the Plan's funded status); and changes in plan provisions or applicable law.

Please refer to the September 30, 2020 Actuarial Valuation Report dated May 14, 2021 for additional discussions regarding the risks associated with measuring the accrued liability and the actuarially determined contribution.

The scope of this report does not include an analysis of the potential range of such future measurements or a quantitative measurement of the future risks of not achieving the assumptions. In certain circumstances, detailed or quantitative assessments of one or more of these risks as well as various plan maturity measures and historical actuarial measurements may be requested from the actuary. Additional risk assessments are generally outside the scope of an experience study. Additional assessments may include stress tests, scenario tests, sensitivity tests, stochastic modeling, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability.

Actuarial Disclosures

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board.

This report is intended to assess the actuarial assumptions and methods and the financial effect of the proposed assumption changes on the Retirement System. Except as otherwise noted, potential effects on other benefit plans were not considered. This report should not be relied on for any purpose other than the purpose described above. GRS is not responsible for unauthorized use of this report.

The findings in this report are based on data and other information during the period October 1, 2015 to September 30, 2020, and forward-looking estimates of future experience. The valuation was based upon information furnished by WCERS staff, concerning Retirement System benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal reasonability and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by WCERS staff.

The actuarial assumptions and methods, financial data, and participant census data utilized in determining the impact on the Actuarial Liability and Actuarially Determined Contributions are the same actuarial assumptions and methods, financial data, and participant census data used in the Actuarial Valuations as of September 30, 2020 as presented in our reports dated May 14, 2021, except for the changes noted above.

For purposes of determining the impact on the Actuarial Liability and Actuarially Determined Contributions **the date of the valuation was September 30, 2020**. This means that the results of the alternate scenarios indicate what the September 30, 2020 valuation would have shown if the proposed assumption changes had been in effect on that date. This valuation does **not** predict the result of future actuarial valuations. Rather, it gives an indication of the cost of the **assumption changes only** without comment on the complete end result of future valuations.

This report was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation and has no material limitations or known weaknesses. We performed tests to ensure that the model reasonably represents that which is intended to be modeled. We are relying on the GRS actuaries and Internal Software, Training, and Processes Team who developed and maintain the model.

Brian B. Murphy, Judith A. Kermans, and Jamal J. Adora are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. The undersigned actuaries are independent of the plan sponsor.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge the information contained in this report is accurate and fairly presents the actuarial position of the Plan as of the valuation date. All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board and with applicable statutes.

Gabriel, Roeder, Smith & Company will be pleased to review this report with the Board and to answer any questions pertaining to it.

Respectfully submitted,

GABRIEL, ROEDER, SMITH & COMPANY

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Section A

Overview and Introduction

Introduction

Each year, as of September 30, the liabilities of the Wayne County Employees' Retirement System are valued. In order to perform the valuation, assumptions must be made regarding the future experience of the System with regard to the following risk areas:

Economic Assumptions

- Long-term rates of price inflation
- Long-term rates of **investment return** to be generated by the assets of the System
- Long-term rates of **wage inflation** (growth of total payroll)
- Patterns of **pay increases** to active members.

Non-Economic Assumptions

- Rates of withdrawal of active members (leaving before eligible to retire)
- Rates of disability among active members
- Rates of retirement among active members
- Rates of mortality among active members, retirees, and beneficiaries

Assumptions should be carefully chosen and continually monitored. A poor initial choice of assumptions or continued use of outdated assumptions can lead to:

- Understated costs resulting in either an inability to pay benefits when due, or sharp increases in required contributions at some point in the future
- Overstated costs resulting in an unnecessarily large burden on the current generation of participants, employers and taxpayers

A single set of assumptions will not be suitable indefinitely. Conditions change, and our understanding of conditions (whether or not they are changing) also changes. So, we adjust assumptions to reflect basic experience trends -- but not random year to year fluctuations.

The results of an experience study for the period October 1, 2015 to September 30, 2020 follow. No single 5-year experience period should be given full credibility in the setting of actuarial valuation assumptions. When we see significant differences between what is expected from our assumptions and actual experience, our strategy in recommending a change in assumptions is usually to select rates that would produce results somewhere between the actual and expected experience. In this way, with each experience study the actuarial assumptions become better and better representations of underlying behavior patterns. Consequently, temporary conditions that might influence a particular experience study period will not unduly influence the choice of long-term assumptions.

We are recommending certain changes in assumptions. The various assumption changes are described on the following pages. Actuarial assumptions were last revised for the September 30, 2016 regular actuarial valuation based on the results of an experience study covering the period from October 1, 2015 to September 30, 2020.

Summary of Findings

The five-year period (October 1, 2015 to September 30, 2020) covered by this experience study provided sufficient data to form a basis for recommending changes in many of the assumptions and/or methods used in the actuarial valuations of the **Wayne County Employees' Retirement System.** Comments on specific assumptions and suggested changes are provided on the following pages.

Liability Weighting

In the past, we have noticed that sometimes the use of new assumptions did not always sufficiently reduce the size of the gain or loss in a particular decrement. Our experience with similar systems has shown that sometimes this is due to the relative magnitude of the liability of the members that decrement, rather than number counts alone. For example, consider a plan with only two members who are both the same age and assume member one has a liability of $10,000 and member two has a liability of $90,000. If one of the members leaves and forfeits all liability, the net rate of decrement is one out of two for a rate of 50%. However, the net change in liability of the System will be less if the member with $10,000 in liability leaves than if the other member leaves. Perhaps the withdrawal rate should be set at 10% if it is the member with $10,000 who leaves service.

As a result, we considered rates weighted by both population and liability. The liability weighted rates were found to be more highly correlated with certain decrement and less so with other decrements. This makes some intuitive sense, since certain decisions are often made based on how much the members have to gain or lose financially, whereas other life events, such as pre-retirement death and disability are not decisions at all, rather events that happen to people.

Mortality: Post-retirement mortality is an important component in cost calculations and should be updated from time to time to reflect current and expected future longevity improvements. Pre-retirement mortality is a relatively minor component in cost calculations. The frequency of pre-retirement deaths is so low that mortality assumptions based on actual experience can only be produced for very large retirement systems, if at all.

Actuarial Standards of Practice

Actuarial Standards of Practice (ASOP) No. 35 Disclosure Section 4.1.1 states, "The disclosure of the mortality assumption should contain sufficient detail to permit another qualified actuary to understand the provision made for future mortality improvement. If the actuary assumes zero mortality improvement after the measurement date, the actuary should state that no provision was made for future mortality improvement." The current mortality rates used in the valuation include a provision for future mortality improvement.

The New Mortality Tables and Projection Scale

The Society of Actuaries (SOA) published new tables called the Pub-2010 tables in early 2019. As opposed to the RP-2014 mortality tables which are based upon private sector pension plan mortality experience, the Pub-2010 mortality tables are based upon public sector pension plan mortality experience. Therefore, our new proposed assumptions are based upon the Pub-2010 mortality tables. The Pub-2010 mortality tables are based upon different employment categories: Teachers, General and Public Safety.

The SOA also publishes annual mortality improvement scales referred to as MP improvement scales. We are proposing updating the mortality improvement scale from the currently used MP-2015 projection scale to the most recent MP-2020 mortality improvement scale.

The table below shows the life expectancy at sample ages by gender under current and proposed assumptions as of 2020 and future years (2030 and 2040) using the recommended projection scale:

Sample Attained Ages	Future Life Expectancy (in years) Determined by Age in Given Year Using Specified Mortality Projection Scale							
	Present Assumption Version of RP-2014 MP-2016		Proposed Assumption 105% of the PubG-2010 Retiree Mortality Table MP-2020					
	Year 2020		Year 2020		Year 2030		Year 2040	
	Men	Women	Men	Women	Men	Women	Men	Women
45	39.72	42.39	39.86	42.85	40.76	43.65	41.68	44.43
50	34.79	37.37	34.76	37.67	35.64	38.47	36.54	39.25
55	30.02	32.43	29.88	32.73	30.75	33.50	31.61	34.26
60	25.44	27.64	25.21	27.90	26.02	28.63	26.83	29.35
65	21.08	23.07	20.77	23.23	21.48	23.87	22.22	24.54
70	16.99	18.73	16.58	18.74	17.17	19.31	17.83	19.91
75	13.20	14.68	12.71	14.54	13.20	15.04	13.75	15.56
80	9.81	11.03	9.32	10.81	9.70	11.20	10.13	11.62
85	6.96	7.93	6.57	7.68	6.83	7.94	7.13	8.25
90	4.80	5.52	4.55	5.30	4.71	5.46	4.90	5.65
95	3.38	3.83	3.19	3.69	3.29	3.77	3.39	3.89
100	2.42	2.70	2.28	2.57	2.34	2.63	2.41	2.69

WCERS currently assumes wage inflation of 3.0%. We estimated the effect with assumed wage inflation at 3.00% and assumed investment return at 5.75%, 6.75% and 7.00%.

Results based upon the recommended demographic assumptions and the range of economic assumptions we are recommending are shown in Section B.

Section B

Impact on Valuation Results

County Results

The table below describes hypothetical valuation results at September 30, 2020 with present and proposed decrement assumptions with alternate economic assumptions.

	County				
		Proposed Demographic Assumptions			
	Present	Economic Assumptions			
Defined Benefit Plans -	Demographic	Present	Alternates		
Contributions for	7.25%/3.00%	7.25%/3.00%	5.75%/3.00%	6.75%/3.00%	7.00%/3.00%
Total Normal Cost	9.50%	8.93%	10.88%	9.48%	9.20%
Less Portion Paid by Members*	7.60%	7.60%	7.60%	7.60%	7.60%
Employer Defined Benefit Normal Cost	1.90%	1.33%	3.28%	1.88%	1.60%
Unfunded Actuarial Accrued Liability#	49.33%	49.02%	67.86%	54.97%	51.92%
Total Computed Employer Rate	**51.23%**	**50.35%**	**71.14%**	**56.85%**	**53.52%**
Minimum Dollar Amounts	**$ 52,411,871**	**$ 51,517,853**	**$ 72,778,490**	**$ 58,165,850**	**$ 54,758,991**
Actuarial Accrued Liability	$1,343,982,271	$1,340,928,868	$1,535,308,594	$1,400,396,567	$1,370,056,856
Funding Value of Assets	873,374,789	873,374,789	873,374,789	873,374,789	873,374,789
Unfunded Actuarial Accrued Liability	470,607,482	467,554,079	661,933,805	527,021,778	496,682,067

* *Weighted average of various contribution rates.*

\# *Change in UAAL due to assumption changes is amortized in a new 10-year layer if positive, or added to the base layer (with 14 years remaining) if negative. Amortization is a level percent of payroll for County and a level dollar for Airport.*

Contributions for fiscal year 2022 have already been determined based on the September 30, 2020 valuation. Contribution rates for fiscal year 2023 will be based on the September 30, 2021 valuation. The September 30, 2021 valuation will be the first valuation using the new assumptions to develop the computed employer contribution rates and dollar amounts. Experience gains or losses incurred during 2021 will also affect FY 2023 contribution rates.

We recommend that the Board :

- **Adopt the demographic assumptions presented in this report.**
- **Adopt one of the economic combinations illustrated above. More discussion on the alternates follows.**

Airport Results

The table below describes hypothetical valuation results at September 30, 2020 with present and proposed decrement assumptions with alternate economic assumptions.

	Airport				
		Proposed Demographic Assumptions			
	Present	Economic Assumptions			
Defined Benefit Plans -	Demographic	Present	Alternates		
Contributions for	7.25%/3.00%	7.25%/3.00%	5.75%/3.00%	6.75%/3.00%	7.00%/3.00%
Total Normal Cost	8.82%	8.95%	12.28%	9.91%	9.41%
Less Portion Paid by Members*	1.94%	1.94%	1.94%	1.94%	1.94%
Employer Defined Benefit Normal Cost	6.88%	7.01%	10.34%	7.97%	7.47%
Unfunded Actuarial Accrued Liability#	19.70%	18.92%	35.02%	23.99%	21.37%
Total Computed Employer Rate	**26.58%**	**25.93%**	**45.36%**	**31.96%**	**28.84%**
Minimum Dollar Amounts	**$ 6,375,282**	**$ 6,290,508**	**$ 10,971,775**	**$ 7,741,861**	**$ 6,990,212**
Actuarial Accrued Liability	$178,467,344	$177,427,400	$208,042,429	$186,780,380	$182,006,556
Funding Value of Assets	141,664,394	141,664,394	141,664,394	141,664,394	141,664,394
Unfunded Actuarial Accrued Liability	36,802,950	35,763,006	66,378,035	45,115,986	40,342,162

* *Weighted average of various contribution rates.*

\# *Change in UAAL due to assumption changes is amortized in a new 10-year layer if positive, or added to the base layer (with 14 years remaining) if negative. Amortization is a level percent of payroll for County and a level dollar for Airport.*

Contributions for fiscal year 2022 have already been determined based on the September 30, 2020 valuation. Contribution rates for fiscal year 2023 will be based on the September 30, 2021 valuation. The September 30, 2021 valuation will be the first opportunity to see the effect of the new assumptions on computed employer contribution rates. Experience gains or losses incurred during 2021 will also affect FY 2023 contribution rates and dollar amounts.

We recommend that the Board consider:

- **Adopting the demographic assumptions presented in this report.**
- **Adopting one of the economic combinations illustrated above.**

Combined Pre-2002 Retiree Liability

It was agreed (by the impacted parties) that at the end of the 5-year period (September 30, 2020), the resulting UAAL, if any, would either be paid in a lump sum ("termination" liability) or amortized in a manner to be determined at that time. The theoretical UAAL as of September 30, 2020 (pre-experience study) is approximately $6.3 million (as shown in the first 2020 column below). The Experience Study impacts these calculated liabilities, as shown in the remaining columns below.

If the lump sum "termination" liability option is chosen, alternate assumptions used for such situations as outlined in Section 2:303(D)(4)(b) of the Retirement System's Actuarial Funding Policy (including a risk-free interest rate) would be used, resulting in a UAAL amount higher than $6.3 million (based on September 30, 2020 assumptions). For additional detail, please see page A-11 of the September 30, 2020 valuation report.

	Fiscal Year (September 30)					
	2020	2020	2020	2020	2020	2021
	Valuation	Demographic Changes	Demographic / 5.75%	Demographic / 6.75%	Demographic / 7.00%	
(1) Assets BOY	$24,493,195	$24,493,195	$24,493,195	$24,493,195	$24,493,195	
(2) One-time IEF Award Credit#	-	-	-	-	-	
(3) WCAA Payments*	-	-	-	-	-	Not Determined
(4) Benefits Paid to Retirees	3,953,455	3,953,455	3,953,455	3,953,455	3,953,455	
(5) Investment Return Rate (MV)	2.83%	2.83%	2.83%	2.83%	2.83%	
(6) Investment Return Amount	637,606	637,606	637,606	637,606	637,606	
(7) Assets EOY: 1+2+3-4+6	$21,177,346	$21,177,346	$21,177,346	$21,177,346	$21,177,346	
(8) Accrued Liability EOY	27,504,826	27,202,400	29,783,104	28,013,361	27,602,121	
(9) UAAL EOY: (8)-(7)	**$ 6,327,480**	**$ 6,025,054**	**$ 8,605,758**	**$ 6,836,015**	**$ 6,424,775**	

* *Actual payments received during Fiscal Years 2016-2019; increased payments in 2018-2019 acted to prepay for the scheduled 2020 payment.*

\# *In 2015, the WCAA received credit for a portion ($5,326,760) of the Inflation Equity Fund (IEF) award to be used to offset the payments towards the Combined Pre-2002 Retiree liability.*

Section C

Economic Assumptions

Economic Assumptions

This section provides the Board with the technical information needed to make an informed decision on the System's economic assumptions. The economic assumptions used in the annual actuarial valuations are as follows:

- Investment return,
- Wage inflation,
- Price inflation,
- Merit and longevity salary increases, and
- Administrative expenses.

Each of these assumptions will be discussed and in some cases the relationships between assumptions will also be discussed. For example, the difference between the investment return assumption and the price inflation assumption is often referred to as the spread or the real return for investment purposes. This information can be useful for investment purposes when assessing certain risk premiums. For actuarial purposes, the difference between the investment return and wage inflation assumption is also a useful measure of the spread or real return since benefits (and hence liabilities) grow with wages not prices. Whenever possible, we will make the distinction clear, but in general, real return is understood most commonly to relate to price inflation.

A summary of the economic assumptions currently in place for WCERS is as follows:

- Assumed rate of investment return – 7.25% per year, net of investment expenses),
- Assumed rate of wage inflation – 3.00% per year,
- Assumed rate of price inflation – 2.50% per year (although not specifically used/necessary),
- Assumed rate of merit and longevity pay increases – rates based on the age or service of the member, and
- Assumed size of the active population – expected to remain at the current level for County members.

Many of the economic assumptions are developed using a building block method which depends on the analysis of price inflation.

Economic Assumptions – Price Inflation

Price inflation underlies both the wage inflation and investment return assumptions. Therefore, we recommend that a specific price inflation assumption be adopted in conjunction with this Experience Study. For the actuarial valuation, a 2.50% price inflation assumption is currently used and is compatible with the wage inflation and investment return assumptions currently in place.

Historical Observation

Over the past 60 years, price inflation has averaged 3.7%. This result is heavily affected by the high inflationary period of the 1970s and early 1980s. During the past decade, price inflation averaged 1.7%.

Calendar Year Period	Inflation (CPI)
1950-1959	2.2%
1960-1969	2.5%
1970-1979	7.4%
1980-1989	5.1%
1990-1999	2.9%
2000-2009	2.5%
2010-2019	1.8%
2015	0.7%
2016	2.1%
2017	2.1%
2018	1.9%
2019	2.3%
2020	1.4%
Last 5 Years	**2.0%**
Last 10 Years	**1.7%**
Last 20 Years	**2.0%**
Last 30 Years	**2.2%**
Last 40 Years	**2.8%**
Last 50 Years	**3.8%**
Last 60 Years	**3.7%**

Economic Assumptions – Price Inflation

Future Expectations

The table below shows forward-looking price inflation forecasts:

Forward-Looking Price Inflation Forecasts[a]	
Congressional Budget Office[b]	
5-Year Annual Average	2.18%
10-Year Annual Average	2.29%
Federal Reserve Bank of Philadelphia[c]	
5-Year Annual Average	2.20%
10-Year Annual Average	2.20%
Federal Reserve Bank of Cleveland[d]	
10-Year Expectation	1.48%
20-Year Expectation	1.75%
30-Year Expectation	1.95%
Federal Reserve Bank of St. Louis[e]	
10-Year Breakeven Inflation	2.28%
20-Year Breakeven Inflation	2.38%
30-Year Breakeven Inflation	2.23%
U.S. Department of the Treasury[f]	
10-Year Breakeven Inflation	2.36%
20-Year Breakeven Inflation	2.32%
30-Year Breakeven Inflation	2.35%
50-Year Breakeven Inflation	2.36%
100-Year Breakeven Inflation	2.37%
Social Security Trustees[g]	
Ultimate Intermediate Assumption	2.40%

a. End of the First Quarter, 2021. Version 2021-07-11 by Gabriel, Roeder, Smith & Company, which removes an incorrect date of 2/1/2021 for the Federal Reserve Bank of St. Louis, 20-Year Breakeven Inflation.

b. *The Budget and Economic Outlook: 2021 to 2031*, Release Date: February 2021, Consumer Price Index (CPI-U), Percentage Change from Year to Year, 5-Year Annual Average (2021-2025), 10-Year Annual Average (2021-2030).

c. *First Quarter 2021 Survey of Professional Forecasters*, Release Date: February 12, 2021, Headline CPI, Annualized Percentage Points, 5-Year Annual Average (2021-2025), 10-Year Annual Average (2021-2030).

d. Inflation Expectations, Model output date: March 1, 2021.

e. The breakeven inflation rate represents a measure of expected inflation derived from X-Year Treasury Constant Maturity Securities and X-Year Treasury Inflation-Indexed Constant Maturity Securities. Observation date: March 1, 2021.

f. *The Treasury Breakeven Inflation (TBI) Curve*, Monthly Average Rates, March, 2021.

g. *The 2020 Annual Report of The Board of Trustees of The Federal Old-Age And Survivors Insurance and Federal Disability Insurance Trust Funds*, April 22, 2020, Long-range (75-year) assumptions, Intermediate, Consumer Price Index (CPI-W), for 2024 and later.

Economic Assumptions – Price Inflation

Other Considerations

We also reviewed the forward-looking inflation assumptions used by the 12 independent investment consulting firms that work with public sector plans. These are shown later in the report. The samples from these firms ranged from 1.92% to 3.10%, with an average of 2.19%.

While the future outlook from the sources in the table on the prior page suggest a lowering of the price inflation assumption would be reasonable, there are a few mitigating factors that we considered when making our recommendation. The mitigating factors are:

- There are some concerns that the level of federal spending that has occurred after these inflation expectations were generated along with the proposed future federal spending could result in upward pressure on price inflation. At the present time, inflation is running well ahead of these projections, possibly making a reduction counter-intuitive;
- Production shortages resulting from pandemic shutdowns in certain areas has increased prices on certain products, at least in the short term;
- The current price inflation is not unreasonable and is not significantly far away from the current future expectations; and
- We believe that the current assumption is still in a reasonable range.

Recommendation

We recommend maintaining an assumed rate of price inflation of 2.50%. Other assumptions may also be reasonable.

(Remember that the selected payroll growth and investment return assumptions should be consistent with the final selected inflation assumption.)

Economic Assumptions – Wage Inflation and Payroll Growth

Wage Inflation consists of two components, 1) a portion due to pure price inflation (i.e., increases due to changes in the CPI), and 2) increases in average salary levels in excess of pure price inflation (i.e., increases due to changes in productivity levels, supply and demand in the labor market and other macroeconomic factors).

The current payroll growth assumption is 3.00%, which is comprised of a 2.50% price inflation assumption plus a real wage growth assumption of 0.50%. The payroll growth assumption is used to develop the amount necessary to amortize the unfunded actuarial accrued liability using the level percent of pay methodology for the County.

Payroll growth represents the expected growth in total payroll for a stable population. Increases or decreases in covered population that lead to a change in total payroll are not reflected in this assumption. If all actuarial assumptions are met, and both the number of active members and their age and service characteristics remain relatively constant, it is expected that payroll growth will be the same as wage inflation.

Recommendation

Based on this information, our opinion is that it would be reasonable to maintain the wage inflation rate at 3.00%. The selection of wage inflation is linked to the selection of price inflation. On a forward-looking basis, we believe that a spread of wages over prices of 0.50% is reasonable.

The combination of 2.5% price inflation and 0.5% real wage growth implies a total payroll growth assumption of 3% per year. As a general rule, the lower the rate of assumed payroll increase, the greater the percentage of pay needed to fund unfunded actuarial accrued liabilities. In our illustrations we have shown 3% total wage growth. If the Board would like to see illustrated contribution rates based upon wage growth assumptions other than 3%, please let us know.

Regardless of what total payroll growth assumption the Board chooses, we recommend continuing the Funding Policy shown in the actuarial valuation reports that specifies a minimum dollar amount for the total contribution.

Economic Assumptions – Administrative Expenses

Currently the administrative expenses are included in the contribution rate, and are effectively paid for each year as part of the contribution requirement. By doing so, the assumed rate of investment return is net of investment expenses only and does not need to be reduced to account for administrative expenses. Over the experience period, the administrative expenses for WCERS (excluding WCAA) averaged approximately 2.23% of payroll, and for WCAA averaged approximately 1.18%. Administrative expenses during the fiscal year ending September 30, 2020 were slightly higher than prior recent years in terms of the dollar amount but payroll during FY 2020 was lower than in prior years. When excluding FY 2020, the averages are 2.19% and 1.13%, respectively.

For the WCAA, if the administrative expenses are continued to be accounted for as a percent of payroll, the impact of a declining payroll due to the closed nature of the group should be considered. Five years ago, the WCAA defined benefit payroll was $30 million; within the next five years it is likely to approach $20 million. Therefore, the administrative expense percentage should be higher than the observed percentage, to account for the steadily declining payroll.

Based on our analysis, we included a contribution of 2.20% of payroll for WCERS (excluding WCAA) and 1.70% of payroll for WCAA for administrative expenses.

Economic Assumptions – Investment Return

The relevant Actuarial Standard of Practice (ASOP) for economic assumptions is ASOP No. 27, Selection of Economic Assumptions for Measuring Pension Obligations[1]. Under ASOP No. 27, Section 3.6, an economic assumption is reasonable if it has the following characteristics:

- It is appropriate for the purpose of the measurement;
- It reflects the actuary's professional judgment;
- It takes into account current and historical data that is relevant to selecting the assumption for the measurement date, to the extent such relevant data is reasonably available;
- It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data (if any), or a combination thereof; and
- It is expected to have no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included (as discussed in Section 3.5.1) or when alternative assumptions are used for the assessment of risk, in accordance with ASOP No. 51, *Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions*.

For purposes of budgeting contributions and measuring liabilities for public employee retirement systems, the assumed rate of investment return is used as the discount rate to determine the present value of a system's pension obligations. For most valuations, an actuarial investment return assumption based on expected future experience is a single estimate for all years and, therefore, implicitly assumes that returns above and below expectations will average out over time. In other words, the expected risk premium is reflected in the assumed rate of investment return in advance of being earned, while the investment risk (i.e., volatility) is not reflected until actual experience emerges with each valuation.

The analysis of the investment return assumption in this report is based on forward-looking measures of expected investment return outcomes for the asset classes in the System's current investment policy. For purposes of this analysis, we have analyzed the System's investment policy with the capital market assumptions from twelve nationally recognized investment firms.

Our analysis is based on the GRS 2021 Capital Market Assumption Modeler (CMAM[2]). Because GRS is a benefits consulting firm and does not develop or maintain its own capital market expectations, we request and monitor forward-looking expectations developed by several major investment firms. We update our CMAM on an annual basis. The capital market assumptions in the 2021 CMAM are from the following investment firms (in alphabetical order): Aon Hewitt, Blackrock, BNY Mellon, Callan, Cambridge, JPMorgan, Meketa, Mercer, NEPC, RVK, Verus, and Wilshire. We believe that the benefit of performing this analysis using multiple investment firms is to recognize the uncertain nature of the items affecting the selection of the investment return assumption. While there may be differences in asset classes, investment horizons, inflation assumptions, treatment of investment expenses, excess manager performance (i.e., alpha), etc., we have attempted to align the various assumption sets from the different investment firms to be as consistent as possible. In some cases, we have made minor adjustments or assumptions to align the various assumptions sets with our model.

Each investment firm provided capital market assumptions over an investment horizon of approximately 10 years. Although investment firms often refer to this period as "short-term" it is important to remember that 10 years is actually a very long time. In fact,a good portion of WCERS liability will be released through benefit

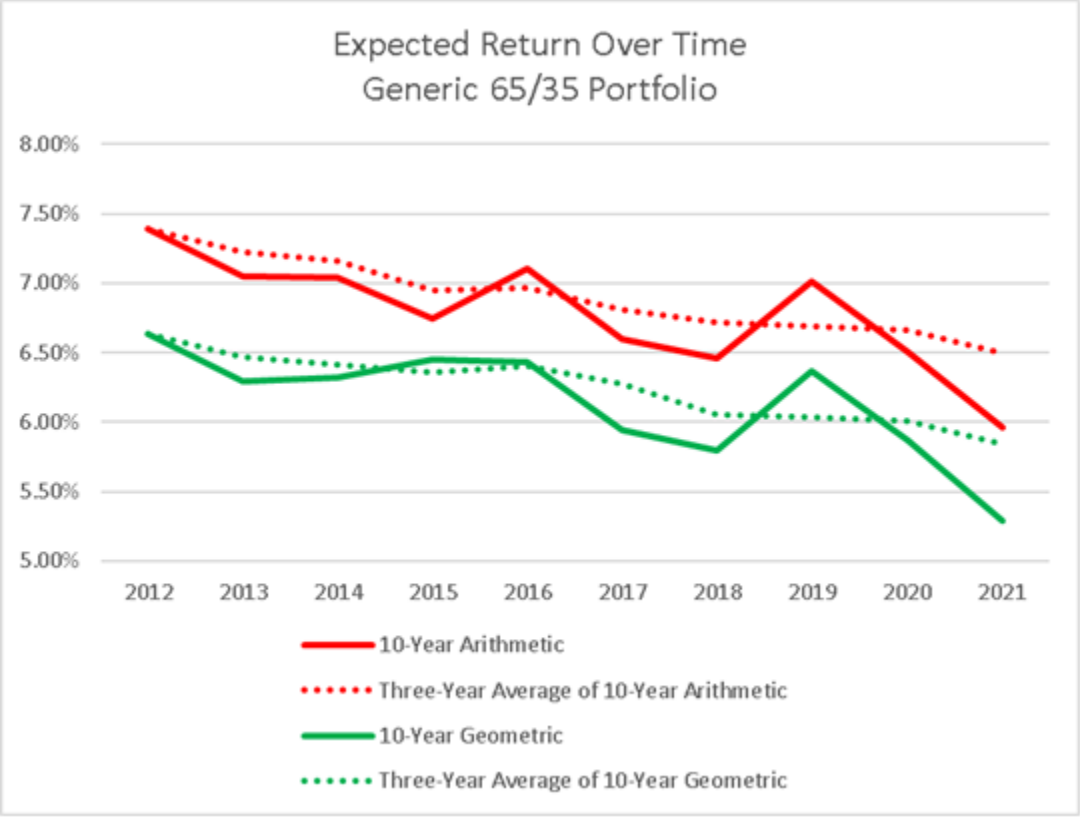
[1] *This ASOP was recently revised by the Actuarial Standards Board. The new version is effective August 1, 2021. The discussion here is based on the new version.*

[2] *Issued 2021-05-04.*

payments due in the next 10 years. Therefore, returns during the next 10 years will affect the plan's funding materially. A subset of six investment firms provided capital market expectations over a longer horizon, varying between 20 and 30 years. For purposes of this report, the analysis is generally based on the 10-year expectations provided by the investment firms.

In general, our understanding is that the methodology for developing these capital market expectations is forward-looking, not purely backward-looking. Over the years, we have observed a general decreasing trend in capital market expectations. However, we have also observed that some of the investment firms' assumption sets are dependent on the market conditions at the time they are developed and consequently may be sensitive to short-term market fluctuations. Some expectations are contrarian – meaning that when the market is high, future expectations are lowered and when the market is low, future expectations are raised. The amount of these fluctuations as they appear in the year-to-year capital market assumptions varies between the various investment firms.

Each year, the GRS CMAM reflects the most up-to-date information at the time the data was collected (typically reflecting the firms' expectations at the beginning of the calendar year). The results of the 2021 survey were generally lower capital market assumptions than 2020 for most asset classes, in some cases substantially lower. This is perhaps due in part to the decrease in bond yields in 2020 to record lows and the high stock market at the end of 2020 (resulting in the contrarian expectation of lower future stock market returns). Looking back to 2019, return expectations were somewhat higher than prior years for some survey participants, perhaps in part due to an increase in bond yields and a decrease in the stock market at the end of 2018. If we consider the three-year average of return expectations, the general decreasing trend is more apparent and the short-term fluctuations are diminished. The chart below illustrates the volatility from year to year from past CMAMs with a generic 65/35 asset allocation. The general declining trend is illustrated with the three-year average of CMAM returns.



To the best of our ability, we have adapted the System's investment policy to fit with the investment firms' assumptions adjusting for these known differences in assumptions and methodology. The asset classes in the system's investment allocation often do not exactly align with the asset classes of all investment firms in the survey. This may require us to make approximations which can introduce some subjectivity into the process. In the following charts, to the extent possible all returns are net of passive investment expenses and have no assumption for excess manager performance (alpha) in excess of active management fees.

For purposes of this analysis, we have reviewed the following investment allocation:

Asset Class	**Target**
Total Equity (14)	50.0%
Domestic Equity (14)	35.0%
Large Cap	21.0%
Mid Cap	7.0%
Small Cap	7.0%
International Equity (14)	15.0%
Developed International	10.0%
Emerging Markets	5.0%
US Fixed Income (17 & 17.1.1.iii)	20.0%
US Investment Grade Fixed Income (17)	15.0%
US Non-Investment Grade Fixed Income (17.1.a.iii)	5.0%
US High Yield Fixed Income	5.0%
Non US Fixed Income (20k)	0.0%
Real Estate (18 & 19)	15.0%
Open Ended Core Real Estate (Private) (19)	4.0%
Private Equity Real Estate Value Add/Special Situation/Opportunistic (19)	11.0%
Alternative Investments	15.0%
Private Equity (Including Fund of Funds, Secondaries, Venture Capital, MI Based)	4.0%
Private Debt (Including Middle Market Debt, Specialty Lending)	8.0%
Opportunistic/Diversifier (Including Global Macro, Hedge Funds, Long/Short, Tactical Asset Allocation, Energy, Natural Resources)	3.0%
Short Term / Cash	0.0%
TOTAL	100.0%

The arithmetic expected return developed from this asset allocation is shown in the table on the following page. The CMAM begins with the nominal expected return from each Capital Market Assumption (CMA) set (column 2), takes out each CMA's price inflation assumption (column 3) to arrive at the real return (column 4). We then incorporate the current price inflation assumption of 2.50% (column 5) to get the adjusted nominal return (column 6). Investment expenses not already netted out of the return (column 7) are netted out of the return. The final arithmetic expected return is shown in column 8. We believe that this is reasonable provided that the current price inflation assumption does not differ materially from the assumptions used by the investment firms. Note that the arithmetic return is in general higher than the median return due to the compounding effect of random returns. In general, the difference between the arithmetic and median return

will be larger for larger standard deviation of returns. We have shown the standard deviation of returns as the investment risk in column 9.

The average arithmetic return and standard deviation from the last three years of CMAMs are shown at the bottom of the table for reference.

GRS 2021 CMAM								
Capital Market Assumption Set (CMA)	CMA Expected Nominal Return	CMA Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Investment Expenses	Expected Nominal Return Net of Expenses (6)-(7)	Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	5.74%	2.21%	3.53%	2.50%	6.03%	0.00%	6.03%	12.50%
2	5.71%	2.15%	3.56%	2.50%	6.06%	0.00%	6.06%	12.34%
3	5.72%	2.00%	3.72%	2.50%	6.22%	0.00%	6.22%	12.13%
4	6.18%	2.34%	3.84%	2.50%	6.34%	0.00%	6.34%	12.94%
5	5.68%	2.01%	3.67%	2.50%	6.17%	0.00%	6.17%	10.96%
6	7.02%	3.10%	3.92%	2.50%	6.42%	0.00%	6.42%	12.91%
7	5.70%	2.00%	3.70%	2.50%	6.20%	0.00%	6.20%	10.90%
8	6.25%	2.40%	3.85%	2.50%	6.35%	0.00%	6.35%	11.77%
9	5.93%	2.00%	3.93%	2.50%	6.43%	0.00%	6.43%	12.25%
10	6.28%	2.11%	4.17%	2.50%	6.67%	0.00%	6.67%	12.08%
11	6.44%	2.01%	4.43%	2.50%	6.93%	0.00%	6.93%	12.73%
12	6.89%	1.92%	4.97%	2.50%	7.47%	0.00%	7.47%	12.76%
Average	**6.13%**	**2.19%**	**3.94%**	**2.50%**	**6.44%**	**0.00%**	**6.44%**	**12.19%**
					Average from last 3 CMAMs		**6.88%**	**12.04%**

The average expected nominal return from column 8 is 6.44%. This figure is roughly comparable to your investment consultant's 6.14% estimate. This is the average arithmetic rate of return. Note that the arithmetic rate of return represents the average future expected return which is higher than the median future expected return. Accumulating assets and cash flows at the average arithmetic rate of return is expected to produce the average asset amount over time. However, in any given year it is less than 50% likely that the arithmetic average rate of return will be achieved. Moreover, over a period of longer than one year, the realized rate of return is generally computed as a geometric average. Additional analysis is required to adjust to the median (or geometric average) return.

Next, we compare the probabilities of achieving returns over a 10-year horizon. We compute the 40th, 50th, and 60th percentiles of returns as well as the probability of achieving the current assumption of 7.25% and the median assumption of 5.75% or the higher assumptions of 6.75% or 7.0% over a 10-year horizon. These estimates are based on the assumption that the distribution of returns for the next 10 years is the same each year. The average median return from the last three years of CMAMs is shown at the bottom of the table for reference.

Note that some investment firms provided capital market sets for both 10 years and a longer horizon with different expectations for the different horizons. The average median from the longer horizon is shown at the bottom of the table for reference.

Capital Market Assumption Set (CMA)	Distribution of 10-Year Average Geometric Net Nominal Return			Probability of exceeding	Probability of exceeding	Probability of exceeding	Probability of exceeding
	40th	50th	60th	7.25%	7.00%	6.75%	5.75%
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	4.31%	5.30%	6.29%	31.05%	33.30%	35.62%	45.41%
2	4.37%	5.35%	6.33%	31.27%	33.56%	35.92%	45.86%
3	4.58%	5.53%	6.50%	32.72%	35.09%	37.52%	47.74%
4	4.54%	5.56%	6.59%	33.96%	36.21%	38.53%	48.16%
5	4.74%	5.61%	6.48%	31.76%	34.35%	37.03%	48.32%
6	4.62%	5.64%	6.67%	34.64%	36.92%	39.25%	48.93%
7	4.78%	5.65%	6.52%	32.09%	34.72%	37.42%	48.81%
8	4.78%	5.71%	6.65%	33.91%	36.39%	38.94%	49.55%
9	4.76%	5.73%	6.71%	34.71%	37.11%	39.57%	49.80%
10	5.04%	6.00%	6.96%	37.10%	39.59%	42.14%	52.60%
11	5.18%	6.18%	7.20%	39.49%	41.90%	44.35%	54.33%
12	5.71%	6.72%	7.74%	44.72%	47.20%	49.69%	59.63%
Average	**4.79%**	**5.75%**	**6.72%**	**34.78%**	**37.20%**	**39.66%**	**49.93%**
Average from last 3 CMAMs over 10-year horizon		**6.21%**					
Current CMAM average over 20- to 30-year horizon		**6.73%**					

The 50th percentile return is also related to the geometric average return. The geometric average of a sequence of returns over a number of years is the compound average of those returns over the number of years compounded. The median return may be considered a reasonable rate of return for purposes of the valuation. The average of 50th percentile returns is 5.75% per year.

Column 5 of table 2 shows the estimated probability of achieving this 7.25%, 7.00, 6.75%, and 5.75% assumed rate of return over a 10-year period. The average probability of achieving 7.25% over 10 years is 35%; 7.00% over 10 years is 37%; 6.75% over 10 years is 40%; and 5.75% over 10 years is 50%.

As discussed, the 2021 CMAM generally results in much lower expectations than previous years on the 10-year horizon. For reference, the 3-year average CMAM median return is 6.21% and 3-year average CMAM (arithmetic) nominal expected return is 6.88%. For reference, the median assumption over a longer horizon of 20-30 years is 6.73%, based on six of the investment firms longer horizon CMAs.

Generally, we are comfortable with an investment return assumption that falls between the arithmetic mean and median geometric nominal return. Based on the 2021 CMAM results, this would be an assumption between 5.75% and 6.44%.

Given that range is lower than the current assumption and it reflects a trend that we have continued to observe over the past few years, we recommend lowering the current assumed rate of return. So as not to overreact to short term outlooks, we feel comfortable broadening our analysis to consider the 3-year average of our CMAM results. Based on the 3-year average CMAM, an assumption up to 6.88% can be deemed reasonable without additional justification. The (current) State-mandated assumption for financial reporting is 7.00%. In light of the fact that we appear to be on the tail end of an unprecedented event (the COVID-19 pandemic), we would be comfortable broadening this range a bit more. In any case, we do not recommend using an assumption above 7.00%.

Recommendation

We recommend lowering the assumed rate of return below the current 7.25%. For purposes of this study, we have shown economic scenarios with rate of return assumptions of 5.75%, 6.75% and the current Michigan PA 202 rate of 7.00%, net of investment expenses. The Michigan Treasury is expected to announce within the next couple of months, updated PA 202 assumptions for the following fiscal year; we anticipate that they may lower the rate below the current 7.00%. Our preferred range for assumptions would be 5.75% to 6.88%. An assumption at the upper end of this range carries with it the risk that it may not be reasonable next year. In particular, given the capital market expectations from our CMAM and the information received from your investment consultant, an assumption significantly above 5.75% is expected to result in a failure to meet the assumption, on average, over the next ten years or so.

Economic Assumptions – Merit and Seniority Assumptions

Pay increases granted to active members typically consist of two pieces:

1. An across-the-board, economic type of increase granted to most or all members of the group. This increase is typically tied to wage inflation or cost-of-living changes, and
2. An increase as a result of merit and seniority. This increase is typically related to the performance of an individual and includes promotions and increased years of experience.

The assumption for across-the-board increases is the pay inflation assumption are discussed in the wage inflation section. The merit and seniority portion of pay increases are discussed in this section.
We reviewed the merit and seniority assumption by examining the average pay as of September 30, 2020 by both age and service.

This analysis suggests a need to slightly modify the merit/seniority pay increase assumption.

Recommendation

We recommend revising the assumed rates of merit and longevity as indicated on pages 54-57.

Section D

Mortality Experience

Mortality Summary - All Groups

Findings

The current and proposed rates assume that future mortality rates will continue to decline with each generation. For this "generational" approach, this means that next year's 65-year-old will generally have a slightly longer life expectancy than this year's 65-year-old, etc. Post-retirement mortality is an important, but relatively stable ingredient in cost calculations. This assumption should be updated from time to time to reflect longevity improvements.

Healthy Retirees

We reviewed the mortality experience of healthy retirees during the five-year period. Due to potential anti-selection bias as well as data needs which are outside the scope of the annual valuation process, we did not include beneficiary and survivor mortality experience in our study. The results are shown on the following pages.

The System experienced about the same number of deaths as projected by the present assumptions on a population basis. The System experienced less deaths than projected on a liability-weighted basis. We recommend adopting the PubG-2010 Retiree Mortality Tables and increasing rates by 5% for males and females to reflect System experience. This is based on an analysis of the liability-weighted experience rates at the higher exposure age bands (i.e., 60 through 85) and a partial credibility analysis.

Disabled Retirees

We determined that disabled mortality experience during the study period was not sufficient to be credible on a liability-weighted basis and recommend adopting the PubG-2010 Disabled Retiree Mortality Tables with no adjustment.

Active Members

We determined that the active mortality experience during the study period was not sufficient to be credible on a liability-weighted basis and recommend adopting the PubG-2010 Employee Mortality Tables with no adjustment.

Mortality Improvement

The SOA also publishes annual mortality improvement scales referred to as MP improvement scales. We are proposing updating the mortality improvement scale from the currently used MP-2016 projection scale to the most recent MP-2020 mortality improvement scale.

Partial Credibility

For healthy retirees and disabled retirees, we use the limited fluctuation credibility procedure to determine the appropriate scaling factor of the base mortality tables for each gender on a benefits-weighted basis. In each case, the Z-factor is computed based on the experience of the group being studied. This Z-factor is a measure of the credibility of the pertinent group.

The Best Fit is the ratio of actual to expected deaths using the base table. The final scale is then determined as the weighted average of the Best Fit and 100% based on the Z-factor. For example, the Z-factor for retired males is 43% suggesting that the data for this group is 43% credible. The Best Fit for this group would be to scale the base tables by 112%. The final scale of 105% is the credibility-weighted average (105% = 43% x 112% + 57% x 100%).

For retired females, a similar weighting is done with the Best Fit of 105% being used as the final scale.
No adjustment was made to the disabled or pre-retirement mortality tables due to insufficient experience.

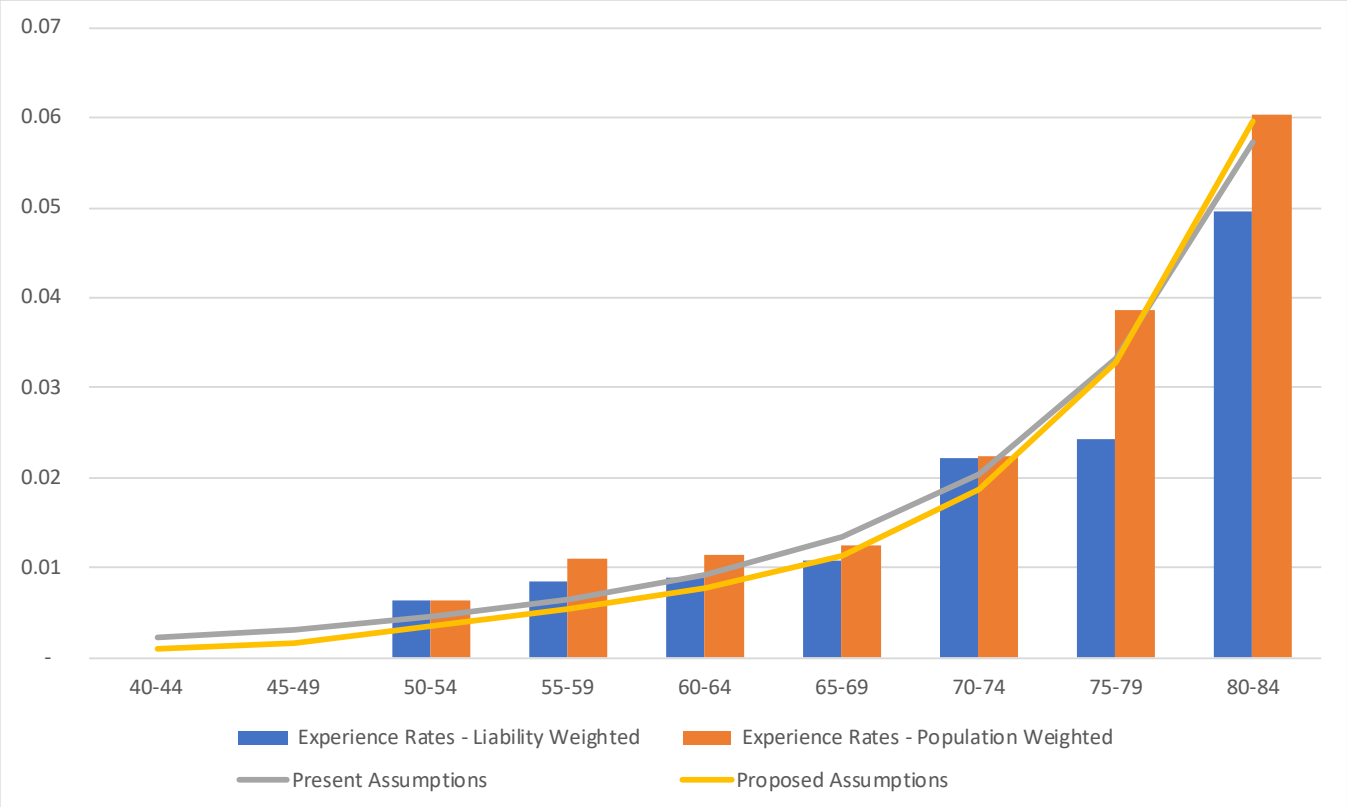
	Benefits Weighted Deaths Needed for Full Credibility	Observed Deaths	Z-Factor	Best Fit	Final Scale Factor
Healthy Male Retirees	2,467	457	43%	112%	**105%**
Healthy Female Retirees	3,682	366	32%	117%	**105%**

Post-Retirement Mortality Experience – Healthy Males

	Population Weighted		Benefit Weighted		Weighted By	Sample Rates		
Age	Deaths	Exposure	Deaths	Exposure	Population	Benefits	Present	Proposed
40-44	-	2	-	3.50	0.000000	0.000000	0.002165	0.000888
45-49	-	120	-	227.34	0.000000	0.000000	0.003137	0.001656
50-54	4	621	7.25	1,124.65	0.006441	0.006446	0.004657	0.003467
55-59	11	1,000	14.99	1,758.03	0.011000	0.008524	0.006508	0.005308
60-64	15	1,316	18.02	2,023.27	0.011398	0.008905	0.009194	0.007818
65-69	27	2,180	27.12	2,499.00	0.012385	0.010850	0.013364	0.011403
70-74	44	1,967	37.93	1,714.61	0.022369	0.022120	0.020451	0.018625
75-79	55	1,420	22.11	908.91	0.038732	0.024329	0.033367	0.032762
80-84	65	1,078	25.11	505.55	0.060297	0.049664	0.057236	0.059736
85-89	104	870	31.68	281.75	0.119540	0.112430	0.100927	0.107434
90-94	97	436	22.53	84.07	0.222477	0.267996	0.172562	0.178986
95-99	32	117	3.40	14.41	0.273504	0.236295	0.256365	0.268920
Other	3	20	0.33	1.91	0.150000	0.172239	0.495080	0.520168
Totals	457	11,147	210.46	11,147.00	0.040998	0.018880		

In order to show the fit for the five-year period of the study, Proposed Sample Rates and Proposed Expected Deaths were determined using the proposed mortality rates projected to the mid-point of the study (2018) using projection scale MP-2020.

Due to potential anti-selection bias as well as data needs which are outside the scope of the annual valuation process, we did not include beneficiary and survivor mortality experience in our study.

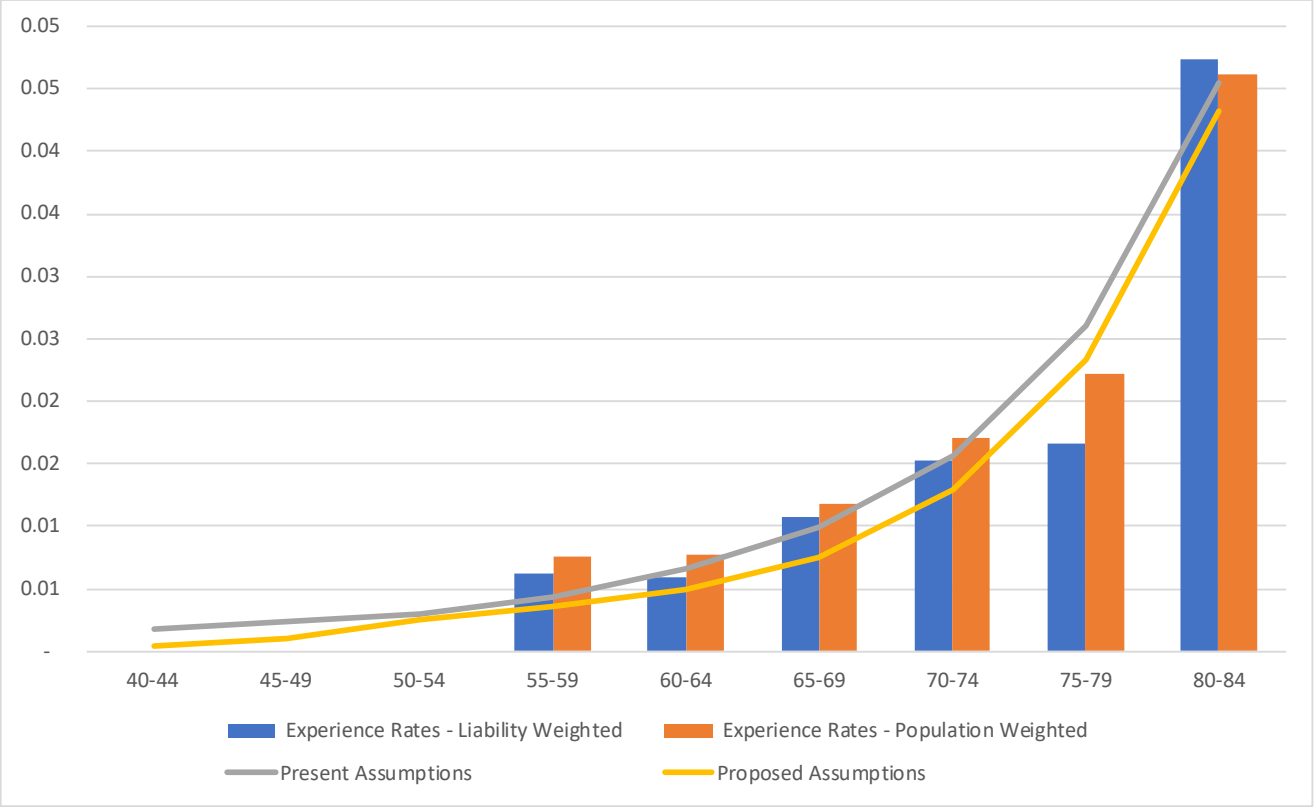


Post-Retirement Mortality Experience – Healthy Females

	Population Weighted		Benefit Weighted		Experience Rates Weighted By		Sample Rates	
Age	Deaths	Exposure	Deaths	Exposure	Population	Benefits	Present	Proposed
45-49	-	41	-	89.06	0.000000	0.000000	0.002315	0.001057
50-54	-	206	-	508.12	0.000000	0.000000	0.003018	0.002564
55-59	4	524	7.76	1,241.82	0.007634	0.006247	0.004397	0.003553
60-64	7	903	10.06	1,680.36	0.007752	0.005985	0.006571	0.004866
65-69	18	1,532	21.53	2,000.10	0.011749	0.010766	0.009896	0.007454
70-74	29	1,692	24.53	1,603.52	0.017139	0.015299	0.015709	0.012864
75-79	28	1,257	14.68	885.43	0.022275	0.016581	0.026083	0.023381
80-84	42	910	20.34	428.66	0.046154	0.047460	0.045441	0.043244
85-89	77	823	22.25	244.06	0.093560	0.091187	0.081594	0.081507
90-94	94	624	17.50	109.53	0.150641	0.159779	0.141758	0.145340
95-99	53	279	5.91	32.45	0.189964	0.181996	0.221779	0.227262
Other	14	41	1.06	2.92	0.341463	0.361924	0.467928	0.497696
Totals	366	8,836	145.62	8,836.00	0.041421	0.016481		

In order to show the fit for the five-year period of the study, Proposed Sample Rates and Proposed Expected Deaths were determined using the proposed mortality rates projected to the mid-point of the study (2018) using projection scale MP-2020.

Due to potential anti-selection bias as well as data needs which are outside the scope of the annual valuation process, we did not include beneficiary and survivor mortality experience in our study.

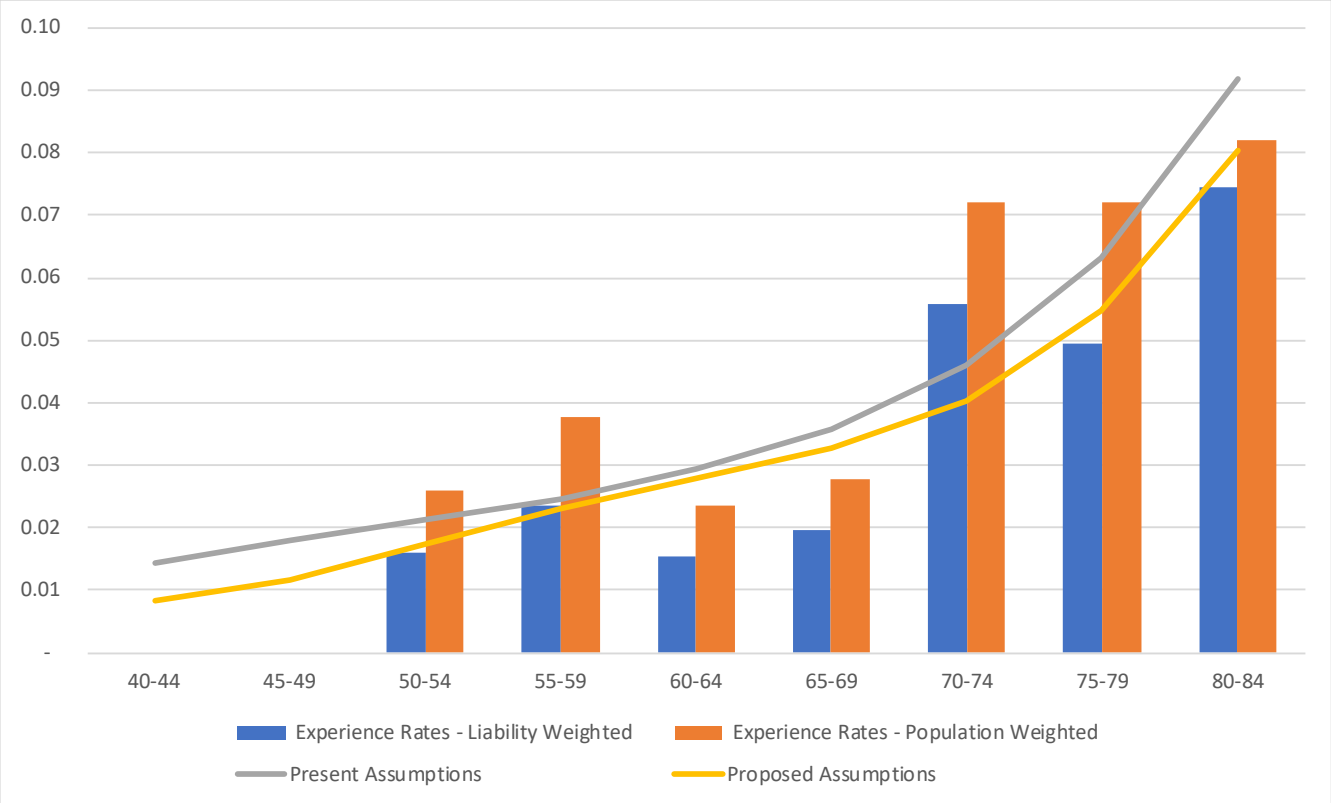


Post-Retirement Mortality Experience – Disabled Males

	Population Weighted		Benefit Weighted		Experience Rates Weighted By		Sample Rates	
Age	Deaths	Exposure	Deaths	Exposure	Population	Benefits	Present	Proposed
45-49	-	56	-	87.85	0.000000	0.000000	0.017861	0.011708
50-54	2	77	1.90	117.80	0.025974	0.016090	0.021382	0.017301
55-59	4	106	3.66	155.81	0.037736	0.023513	0.024670	0.023133
60-64	2	85	1.43	92.34	0.023529	0.015442	0.029400	0.027886
65-69	4	144	2.63	133.54	0.027778	0.019682	0.035794	0.032779
70-74	9	125	4.97	89.20	0.072000	0.055731	0.045867	0.040366
75-79	8	111	3.25	65.83	0.072072	0.049423	0.063141	0.054827
80-84	5	61	1.92	25.76	0.081967	0.074389	0.091881	0.080308
85-89	5	21	0.43	4.22	0.238095	0.102881	0.139213	0.119856
90-94	4	13	0.92	2.48	0.307692	0.372940	0.208305	0.183260
95-99	1	1	0.12	0.12	1.000000	1.000000	0.279701	0.258241
Other	-	-	-	-	N/A	N/A	0.495080	0.494130
Totals	44	818	21.23	818.00	0.053790	0.025950		

In order to show the fit for the five-year period of the study, Proposed Sample Rates and Proposed Expected Deaths were determined using the proposed mortality rates projected to the mid-point of the study (2018) using projection scale MP-2020.

Due to potential anti-selection bias as well as data needs which are outside the scope of the annual valuation process, we did not include beneficiary and survivor mortality experience in our study.

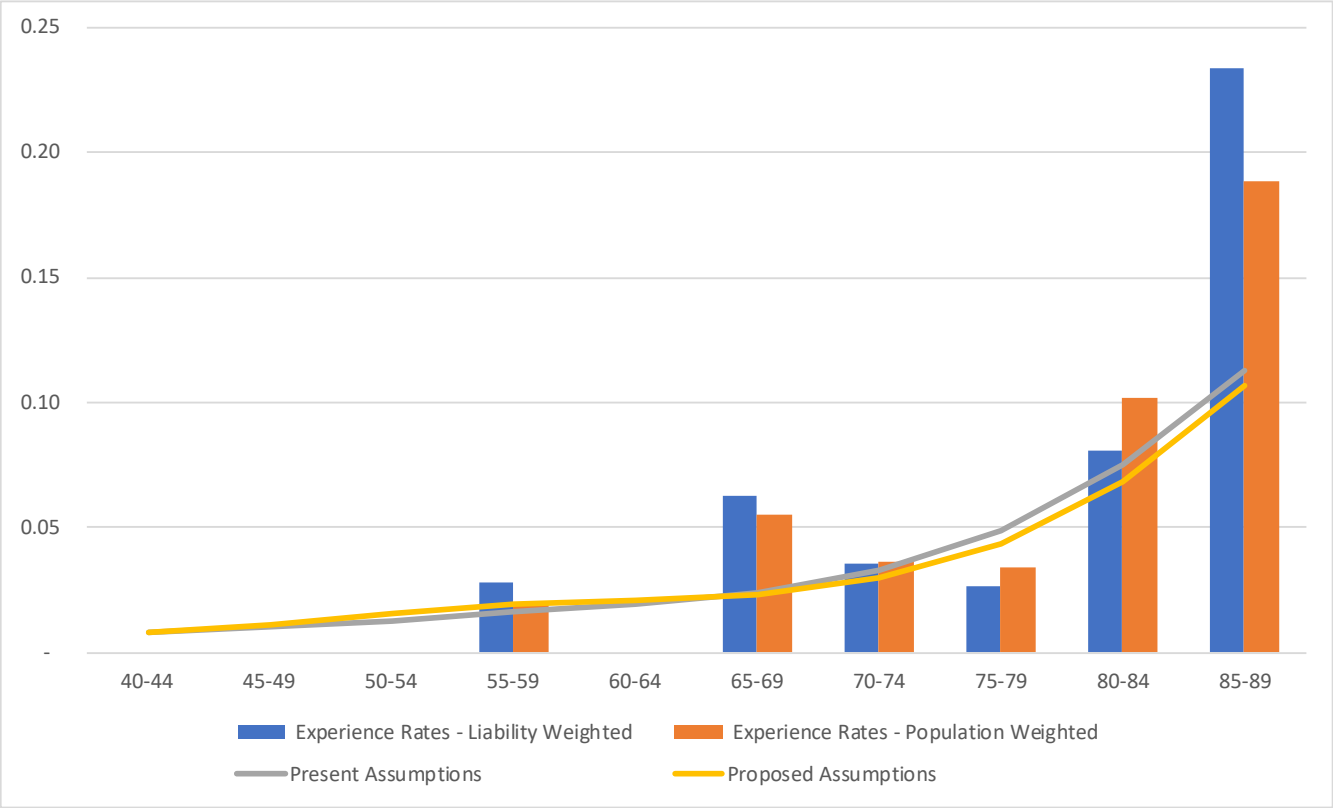


Post-Retirement Mortality Experience – Disabled Females

	Population Weighted		Benefit Weighted		Experience Rates Weighted By		Sample Rates	
Age	Deaths	Exposure	Deaths	Exposure	Population	Benefits	Present	Proposed
45-49	-	27	-	89.86	0.000000	0.000000	0.010040	0.011052
50-54	-	38	-	71.49	0.000000	0.000000	0.012813	0.015711
55-59	1	52	2.31	81.45	0.019231	0.028314	0.016446	0.019457
60-64	-	69	-	83.96	0.000000	0.000000	0.019505	0.020879
65-69	4	72	4.80	76.47	0.055556	0.062812	0.023772	0.022824
70-74	4	109	3.57	101.25	0.036697	0.035305	0.032790	0.029644
75-79	3	87	1.41	53.60	0.034483	0.026223	0.049072	0.043872
80-84	6	59	2.87	35.45	0.101695	0.080962	0.075135	0.068681
85-89	13	69	5.87	25.04	0.188406	0.234264	0.113257	0.106758
90-94	11	45	1.34	7.24	0.244444	0.185760	0.165033	0.151580
95-99	2	11	0.13	1.55	0.181818	0.081891	0.235650	0.217465
Other	2	2	0.40	0.40	1.000000	1.000000	0.467928	0.472719
Totals	46	645	22.70	645.00	0.071318	0.035196		

In order to show the fit for the five-year period of the study, Proposed Sample Rates and Proposed Expected Deaths were determined using the proposed mortality rates projected to the mid-point of the study (2018) using projection scale MP-2020.

Due to potential anti-selection bias as well as data needs which are outside the scope of the annual valuation process, we did not include beneficiary and survivor mortality experience in our study.



Section E

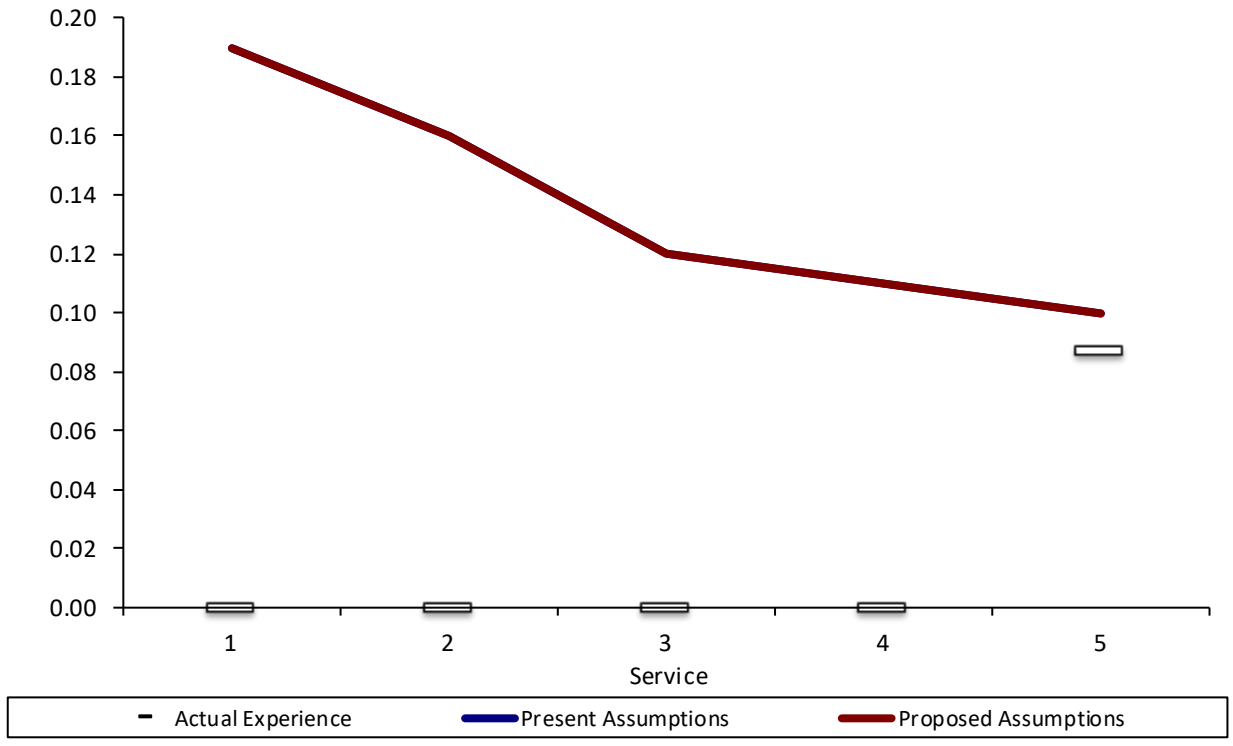
Withdrawal Experience – Service Based

Withdrawal – Airport – Non Public Safety
Plan 5 Only

There were 1.6 liability weighted withdrawals and 30 years of exposure included in the service-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

Service Index	Headcount Weighted Withdrawal	Liability Weighted Withdrawals	Exposure	Crude Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	-	-	-	N/A	0.1900	0.1900	-	-
2	-	-	0.3	0.0000	0.1600	0.1600	-	-
3	-	-	2.3	0.0000	0.1200	0.1200	-	-
4	-	-	8.5	0.0000	0.1100	0.1100	1	1
5	1	1.6	18.9	0.0870	0.1000	0.1000	2	2
Totals	1	1.6	30.0	0.0549	0.1000	0.1000	3	3

Given the size of this group, the small amount of activity and expected small exposure of the group to this decrement going forward, we are not recommending a change to this assumption at this time.

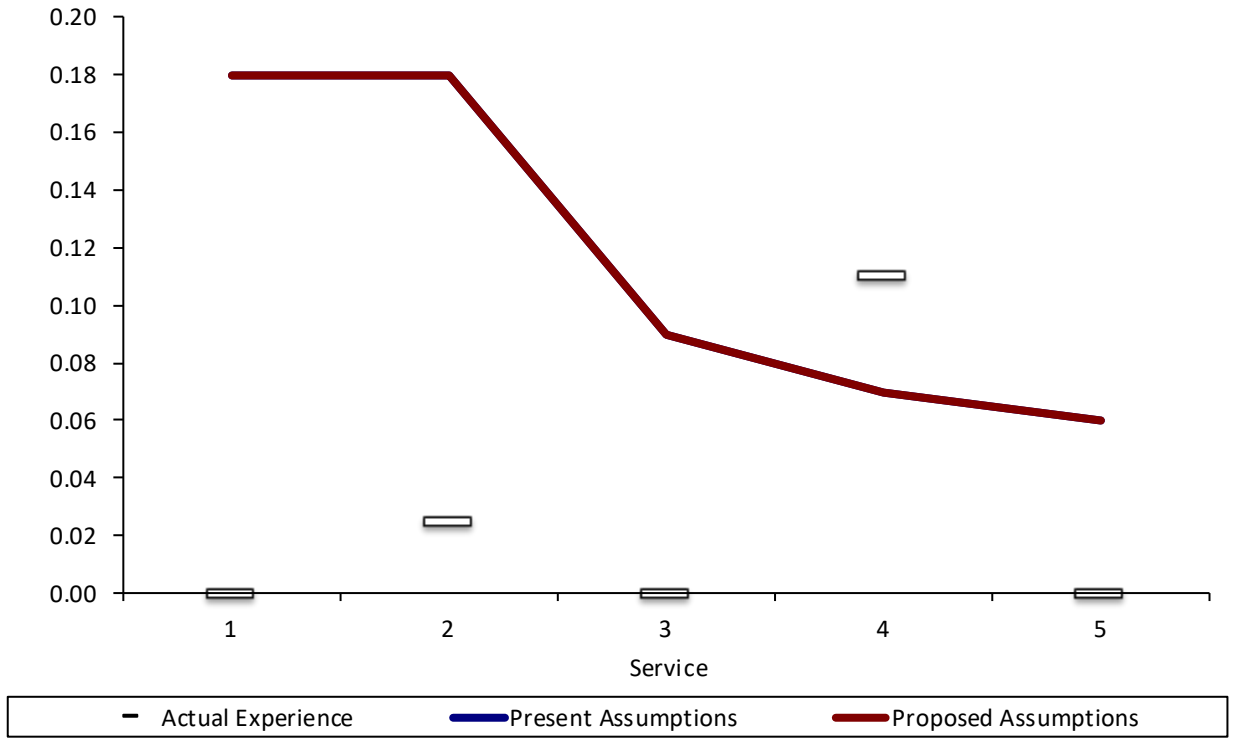


Withdrawal - Airport – Public Safety
Plan 5 Only

There were 3.3 liability weighted withdrawals and 76 years of exposure included in the service-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

Service Index	Headcount Weighted Withdrawal	Liability Weighted Withdrawals	Exposure	Crude Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	-	-	5.3	0.0000	0.1800	0.1800	1	1
2	1	0.3	11.9	0.0250	0.1800	0.1800	2	2
3	-	-	16.6	0.0000	0.0900	0.0900	1	1
4	3	3.0	27.0	0.1099	0.0700	0.0700	2	2
5	-	-	15.3	0.0000	0.0600	0.0600	1	1
Totals	4	3.3	76.0	0.0429	0.0921	0.0921	7	7

Given the size of this group, the small amount of activity and expected small exposure of the group to this decrement going forward, we are not recommending a change to this assumption at this time.

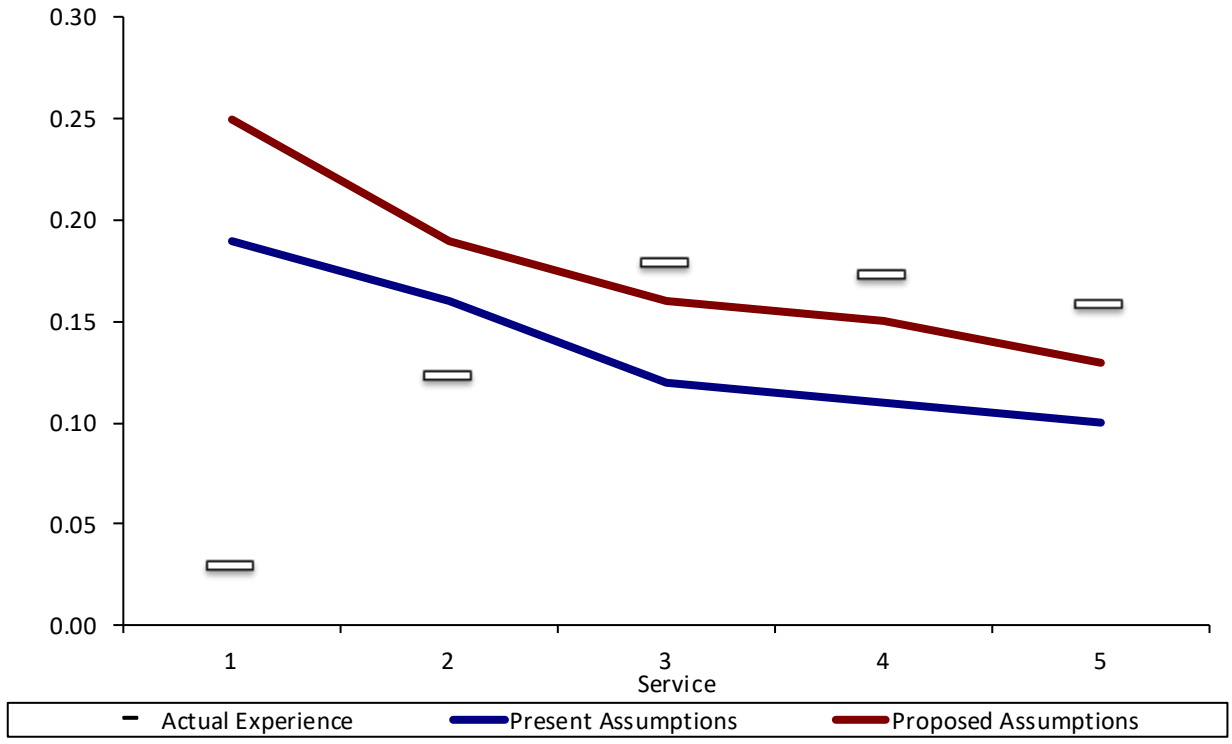


Withdrawal - County – Non Public Safety
Plan 5 and 6 Only

There were 408.1 liability weighted withdrawals and 2,723 years of exposure included in the service-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

Service Index	Headcount Weighted Withdrawal	Liability Weighted Withdrawals	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	141	6.0	201.2	0.0298	0.1900	0.2500	38	50
2	170	68.8	560.5	0.1227	0.1600	0.1900	90	106
3	131	105.3	585.8	0.1797	0.1200	0.1600	70	94
4	93	115.6	667.0	0.1734	0.1100	0.1500	73	100
5	56	112.4	708.6	0.1586	0.1000	0.1300	71	92
Totals	591	408.1	2,723.0	0.1499	0.1256	0.1623	342	442

We used the headcount weighted experience to develop our new rates. We recommend raising rates at all service indexes.

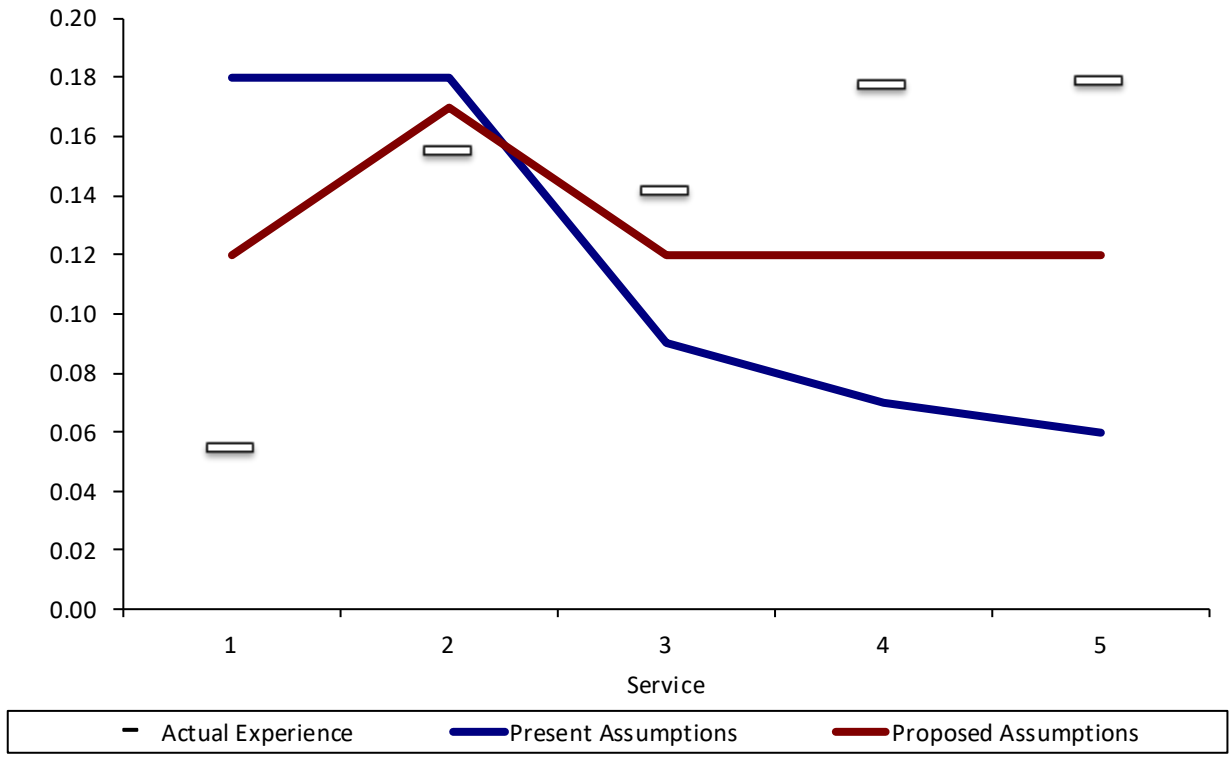


Withdrawal - County – Public Safety
Plan 5 and 6 Only

There were 94.2 withdrawals and 632 years of exposure included in the service-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

Service Index	Headcount Weighted Withdrawal	Liability Weighted Withdrawals	Exposure	Crude Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	64	4.3	79.7	0.0546	0.1800	0.1200	14	10
2	52	25.3	163.5	0.1550	0.1800	0.1700	29	28
3	22	18.8	132.3	0.1418	0.0900	0.1200	12	16
4	20	25.5	143.3	0.1778	0.0700	0.1200	10	17
5	9	20.3	113.2	0.1790	0.0600	0.1200	7	14
Totals	167	94.2	632.0	0.1491	0.1139	0.1345	72	85

We recommend the rates be modified to better match experience.



Section F

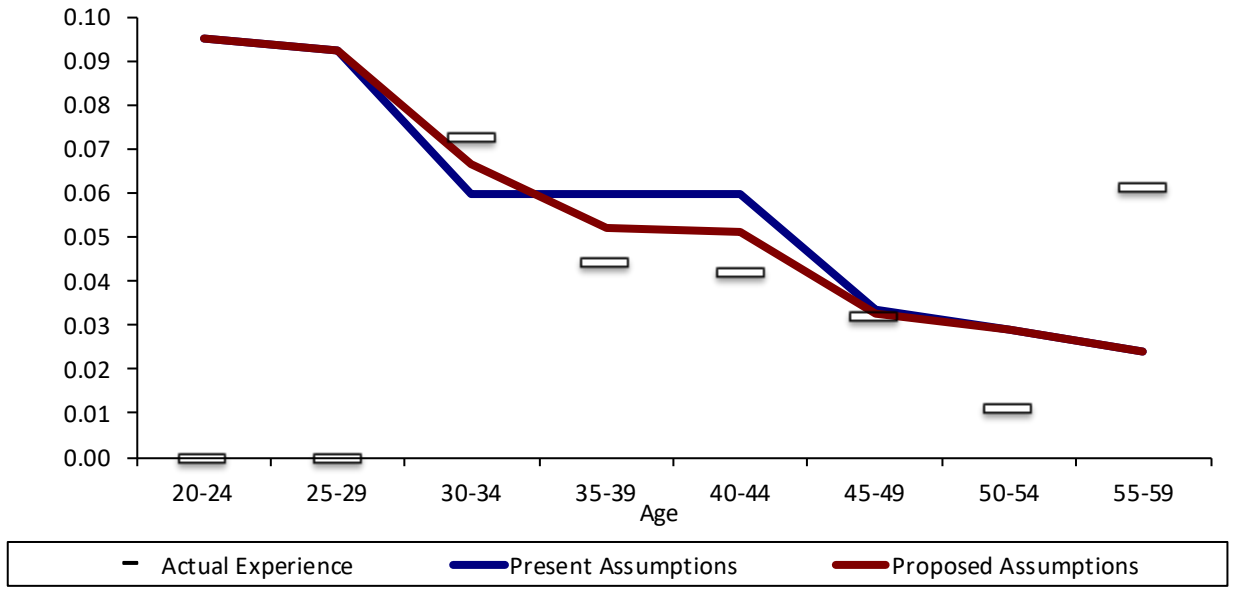
Withdrawal Experience – Age Based

Withdrawal - Airport – Non Public Safety
Plan 5 Only

There were 21.4 withdrawals and 663 years of exposure included in the age-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

Age	Headcount Weighted Withdrawal	Liability Weighted Withdrawals	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
Under 20	-	-	-	N/A	0.0950	0.0950	-	-
20-24	-	-	-	N/A	0.0950	0.0950	-	-
25-29	-	-	0.9	0.0000	0.0925	0.0925	-	-
30-34	2	0.6	8.9	0.0728	0.0600	0.0665	1	1
35-39	3	1.6	36.5	0.0444	0.0600	0.0520	2	2
40-44	5	4.2	99.2	0.0421	0.0600	0.0510	6	5
45-49	3	5.0	154.8	0.0320	0.0337	0.0327	5	5
50-54	3	2.7	242.4	0.0111	0.0289	0.0289	7	7
55-59	2	7.4	120.2	0.0612	0.0240	0.0240	2	2
Totals	18	21.4	663.0	0.0323	0.0347	0.0332	23	22

Only minor changes are being suggested to reflect experience.

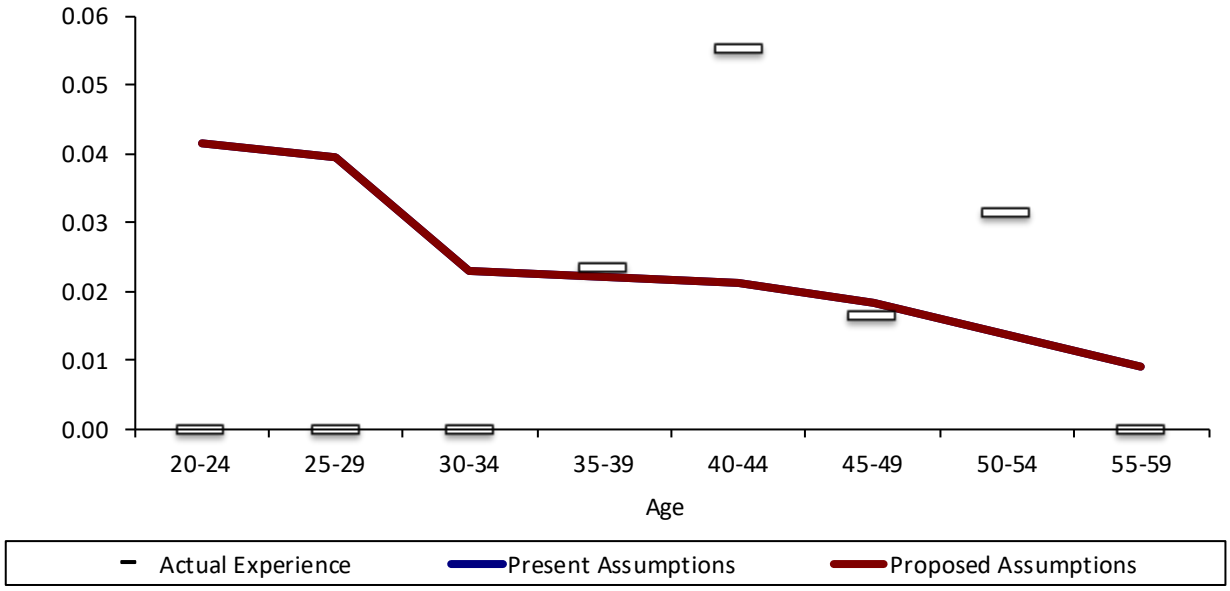


Withdrawal - Airport – Public Safety
Plan 5 Only

There were 11.1 liability weighted withdrawals and 446 years of exposure included in the age-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

Age	Headcount Weighted Withdrawals	Liability Weighted Withdrawals	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
Under 20	-	-	-	N/A	0.0414	0.0414	-	-
20-24	-	-	-	N/A	0.0414	0.0414	-	-
25-29	-	-	0.2	0.0000	0.0396	0.0396	-	-
30-34	-	-	8.8	0.0000	0.0230	0.0230	-	-
35-39	2	0.7	28.8	0.0235	0.0221	0.0221	1	1
40-44	4	2.6	46.2	0.0553	0.0212	0.0212	1	1
45-49	3	2.6	158.1	0.0165	0.0184	0.0184	3	3
50-54	3	5.3	168.8	0.0314	0.0138	0.0138	2	2
55-59	-	-	35.1	0.0000	0.0092	0.0092	-	-
Totals	12	11.1	446.0	0.0250	0.0157	0.0157	7	7

Rates below age 40 were in line with expectations. We recommend no changes to this assumption.

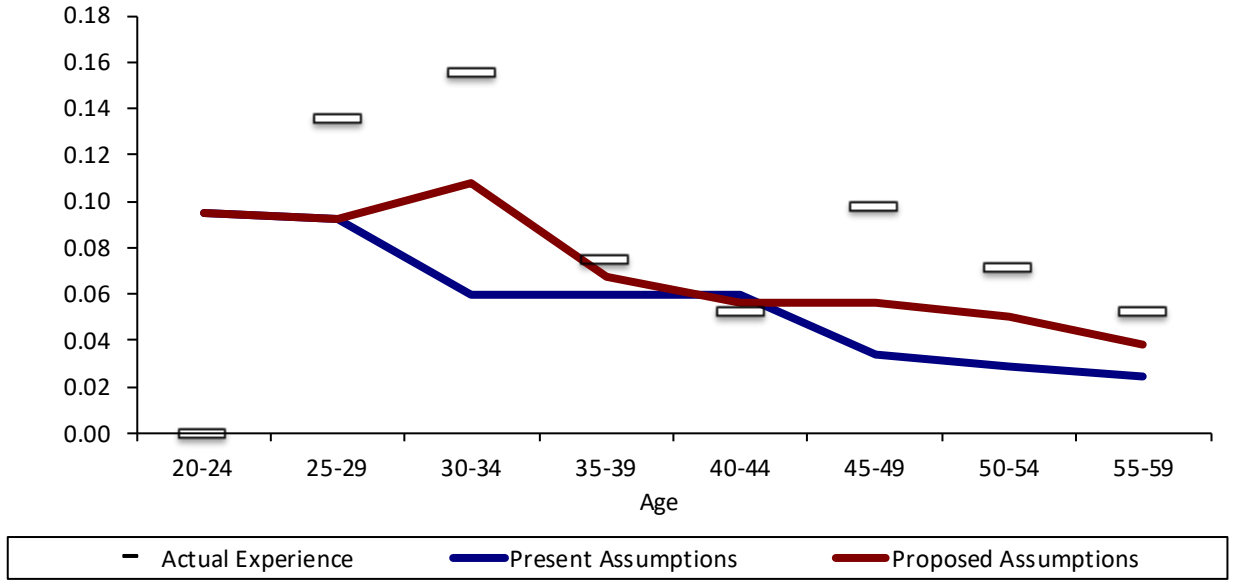


Withdrawal - County – Non Public Safety
Plan 5 and 6 Only

There were 153.3 withdrawals and 2,171 years of exposure included in the age-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

Age	Headcount Weighted Withdrawal	Liability Weighted Withdrawals	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
Under 20	-	-	-	N/A	0.0950	0.0950	-	-
20-24	-	-	0.1	0.0000	0.0950	0.0950	-	-
25-29	9	0.5	3.5	0.1360	0.0925	0.0925	-	-
30-34	26	2.4	15.3	0.1554	0.0600	0.1077	1	2
35-39	44	7.6	102.6	0.0745	0.0600	0.0672	6	7
40-44	32	12.3	232.4	0.0527	0.0600	0.0564	14	13
45-49	46	43.6	444.6	0.0981	0.0337	0.0564	15	25
50-54	40	57.2	807.1	0.0709	0.0289	0.0499	23	40
55-59	27	29.7	565.3	0.0525	0.0240	0.0383	11	19
Totals	224	153.3	2,171.0	0.0706	0.0322	0.0488	70	106

Withdrawals were higher than expected at all ages except 40-44. As such we recommend adjusting the rates as shown above.

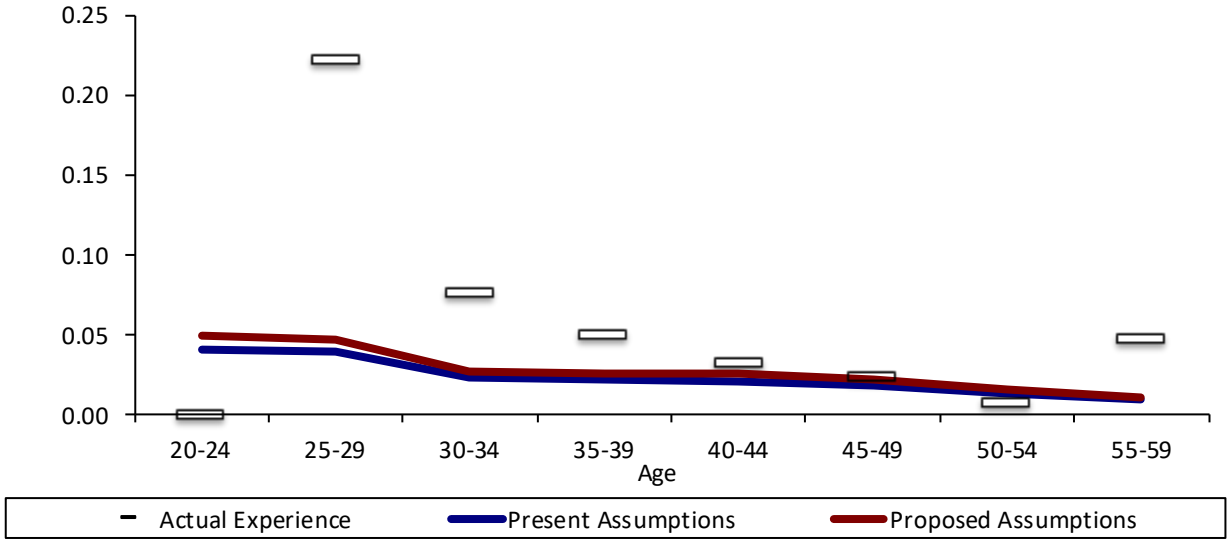


Withdrawal - County – Public Safety
Plan 5 and 6 Only

There were 48.7 liability weighted withdrawals and 2,156 years of exposure included in the age-based withdrawal investigation. Withdrawals are separations from active member status for a reason other than disability, death, or retirement.

Age	Headcount Weighted Withdrawal	Liability Weighted Withdrawals	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
Under 20	-	-	-	N/A	0.0414	0.0495	-	-
20-24	-	-	-	N/A	0.0414	0.0495	-	-
25-29	3	0.2	1.0	0.2224	0.0396	0.0473	-	-
30-34	10	1.4	18.8	0.0759	0.0230	0.0275	-	1
35-39	20	6.5	127.4	0.0507	0.0221	0.0264	3	3
40-44	18	9.4	289.8	0.0326	0.0212	0.0253	6	7
45-49	18	18.1	738.5	0.0245	0.0184	0.0220	13	16
50-54	10	6.6	845.9	0.0079	0.0138	0.0165	12	14
55-59	2	6.4	134.6	0.0473	0.0092	0.0110	1	2
Totals	81	48.7	2,156.0	0.0226	0.0162	0.0199	35	43

Experience was higher than expected at earlier ages and minor changes are being suggested.



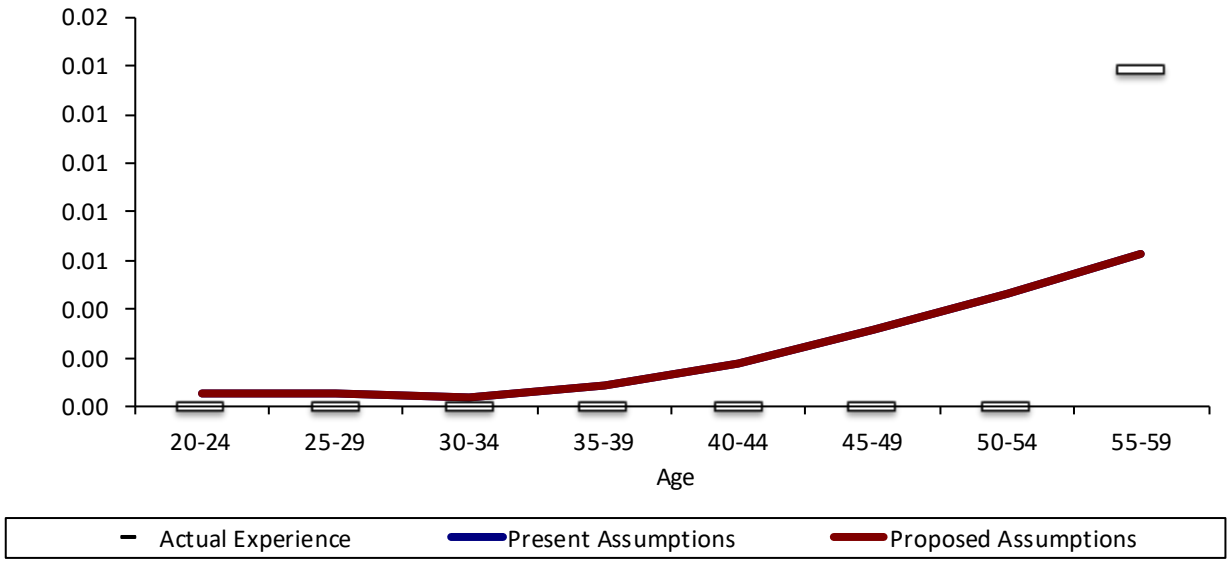
Section G

Ordinary Disability Experience

Disability - Airport – Non Public Safety
Plan 5 Only

There were 1.5 liability weighted ordinary disability benefit claims reported for the 5-year period. Since the current rates of disability are already very low, we are not recommending a change in the rates of disability at this time.

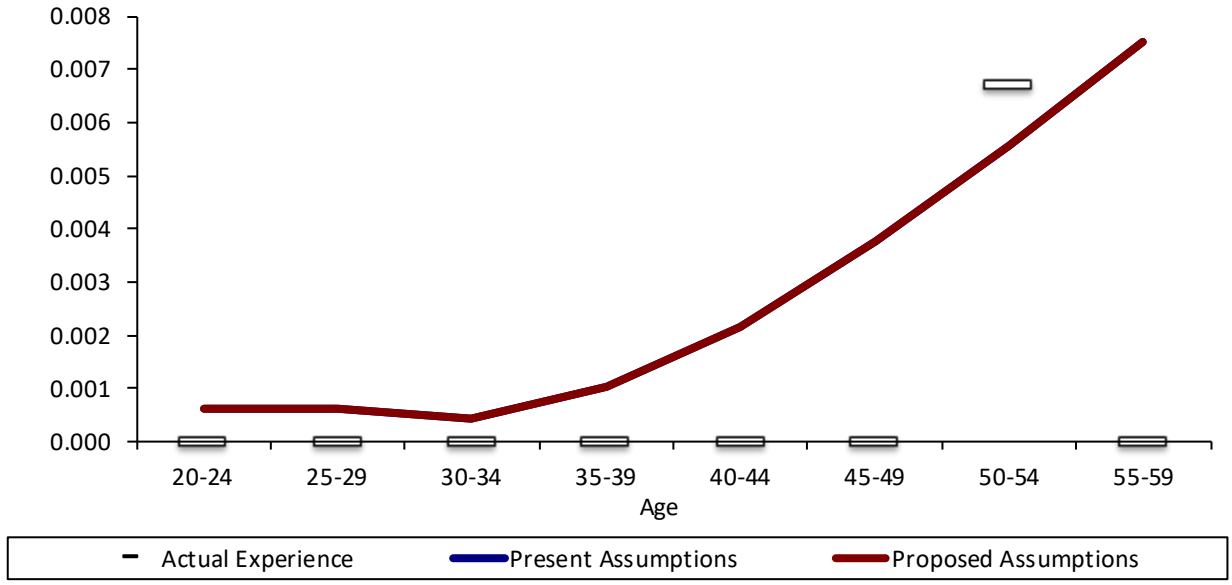
Age	Headcount Weighted Disabilities	Liability Weighted Disabilities	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Disabilities	
					Present	Proposed	Present	Proposed
Under 20	-	-	-	N/A	0.0005	0.0005	-	-
20-24	-	-	-	N/A	0.0005	0.0005	-	-
25-29	-	-	-	N/A	0.0005	0.0005	-	-
30-34	-	-	6.2	0.0000	0.0004	0.0004	-	-
35-39	-	-	29.5	0.0000	0.0009	0.0009	-	-
40-44	-	-	83.1	0.0000	0.0018	0.0018	-	-
45-49	-	-	138.0	0.0000	0.0032	0.0032	-	-
50-54	-	-	217.5	0.0000	0.0047	0.0047	1	1
55-59	2	1.5	105.7	0.0139	0.0063	0.0063	1	1
Totals	2	1.5	580.0	0.0025	0.0034	0.0034	2	2



Disability - Airport – Public Safety
Plan 5 Only

There were 1.1 liability weighted ordinary disability benefit claims reported for the 5-year period. Since the current rates of disability are already very low, we are not recommending a change in the rates of disability at this time.

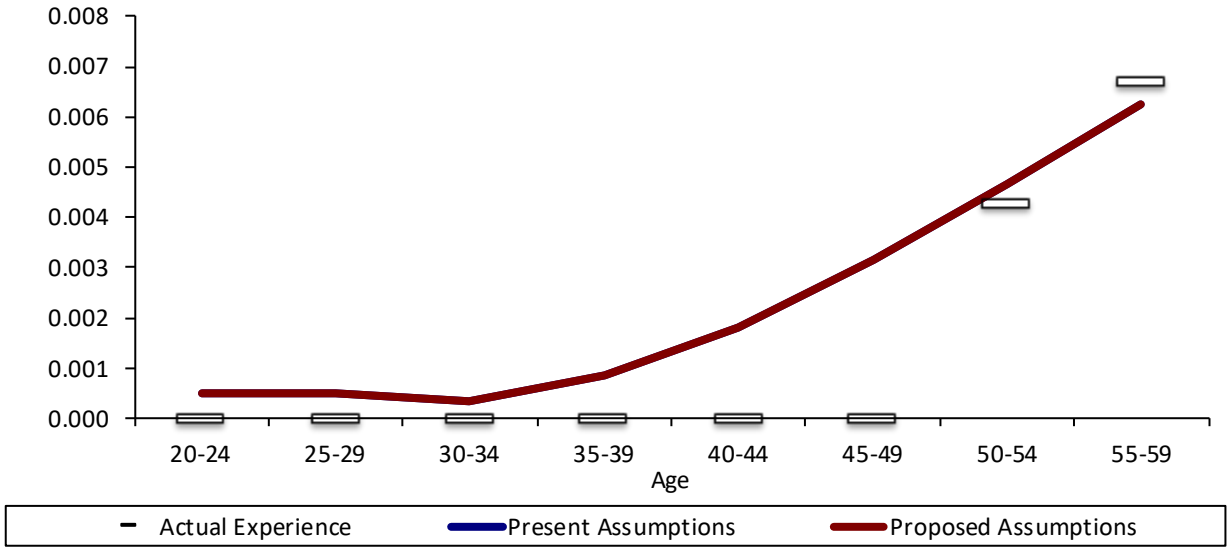
Age	Headcount Weighted Disabilities	Liability Weighted Disabilities	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Disabilities	
					Present	Proposed	Present	Proposed
Under 20	-	-	-	N/A	0.0006	0.0006	-	-
20-24	-	-	-	N/A	0.0006	0.0006	-	-
25-29	-	-	-	N/A	0.0006	0.0006	-	-
30-34	-	-	6.3	0.0000	0.0004	0.0004	-	-
35-39	-	-	26.0	0.0000	0.0010	0.0010	-	-
40-44	-	-	42.3	0.0000	0.0022	0.0022	-	-
45-49	-	-	150.3	0.0000	0.0038	0.0038	1	1
50-54	1	1.1	160.7	0.0067	0.0056	0.0056	2	2
55-59	-	-	33.5	0.0000	0.0075	0.0075	1	1
Totals	1	1.1	419.0	0.0026	0.0095	0.0095	4	4



Disability - County – Non Public Safety
Plan 5 and 6 Only

There were 4.8 liability weighted ordinary disability benefit claims reported for the 5-year period. Since the current rates of disability are already very low, we are not recommending a change in the rates of disability at this time.

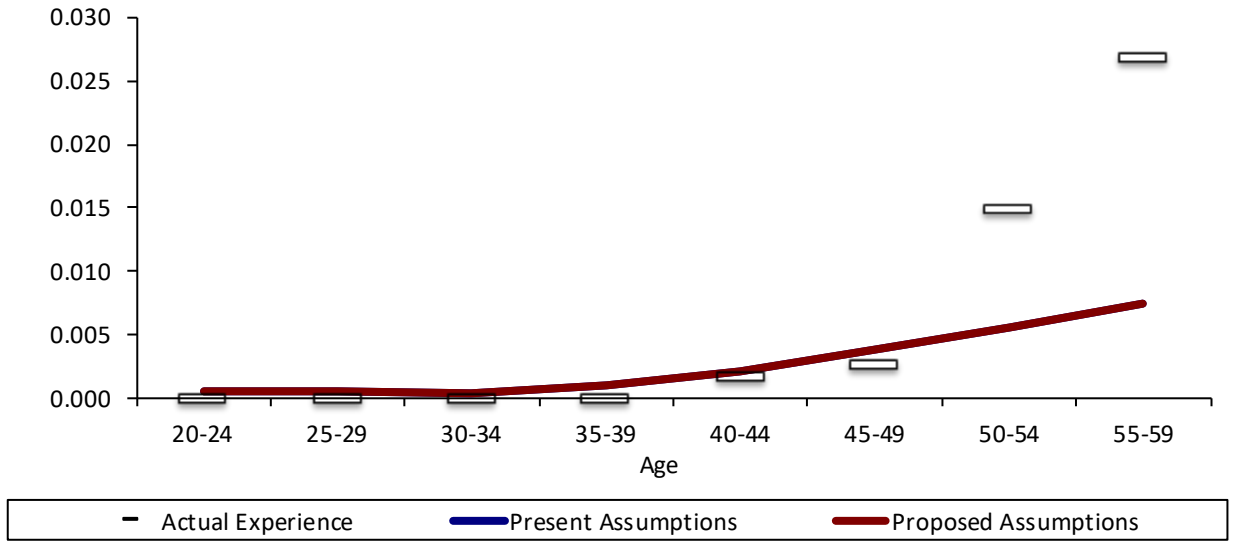
Age	Headcount Weighted Disabilities	Liability Weighted Disabilities	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Disabilities	
					Present	Proposed	Present	Proposed
Under 20	-	-	-	N/A	0.0005	0.0005	-	-
20-24	-	-	-	N/A	0.0005	0.0005	-	-
25-29	-	-	0.0	0.0000	0.0005	0.0005	-	-
30-34	-	-	3.3	0.0000	0.0004	0.0004	-	-
35-39	-	-	48.8	0.0000	0.0009	0.0009	-	-
40-44	-	-	147.5	0.0000	0.0018	0.0018	-	-
45-49	-	-	284.3	0.0000	0.0032	0.0032	1	1
50-54	-	2.3	541.6	0.0043	0.0047	0.0047	2	2
55-59	3	2.5	366.6	0.0067	0.0063	0.0063	-	-
Totals	3	4.8	1,392.0	0.0034	0.0022	0.0022	3	3



Disability - County – Public Safety
Plan 5 and 6 Only

There were 17.1 liability weighted ordinary disability benefit claims reported for the 5-year period. Since the current rates of disability are already very low, we are not recommending a change in the rates of disability at this time.

Age	Headcount Weighted Disabilities	Liability Weighted Disabilities	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Disabilities	
					Present	Proposed	Present	Proposed
Under 20	-	-	-	N/A	0.0006	0.0006	-	-
20-24	-	-	-	N/A	0.0006	0.0006	-	-
25-29	-	-	-	N/A	0.0006	0.0006	-	-
30-34	-	-	12.0	0.0000	0.0004	0.0004	-	-
35-39	-	-	109.8	0.0000	0.0010	0.0010	-	-
40-44	1	0.5	263.3	0.0018	0.0022	0.0022	-	-
45-49	1	1.8	675.8	0.0027	0.0038	0.0038	1	1
50-54	3	11.6	774.7	0.0149	0.0056	0.0056	2	2
55-59	1	3.2	120.4	0.0268	0.0075	0.0075	1	1
Totals	6	17.1	1,956.0	0.0087	0.0020	0.0020	4	4



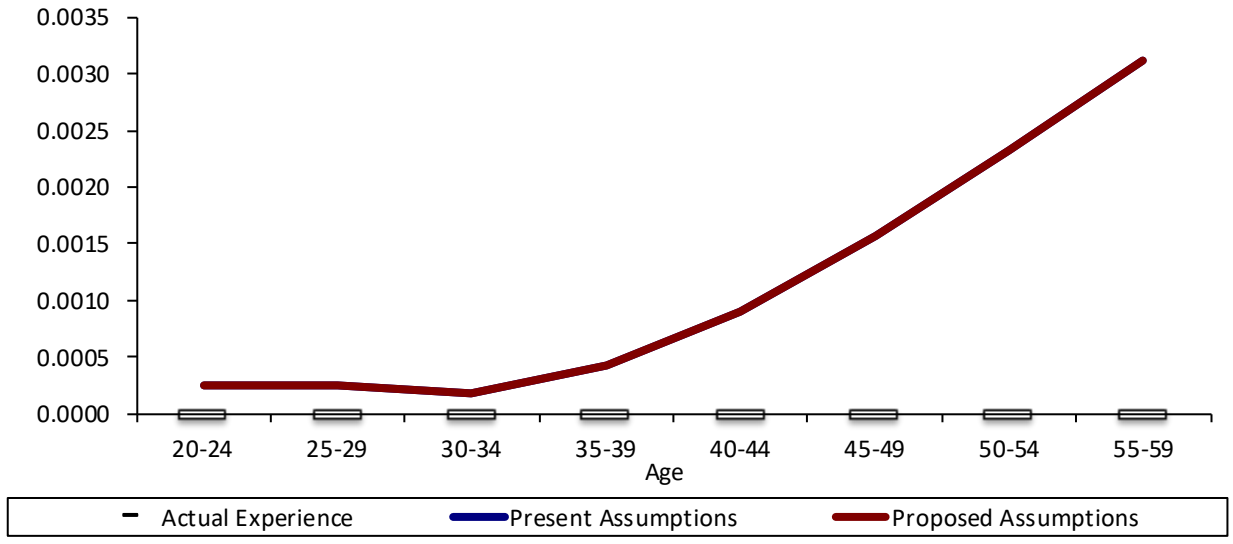
Section H

Duty Disability Experience

Duty Disability - Airport – Non Public Safety
Plan 5 Only

There were 0.0 liability weighted duty disability benefit claims reported for the 5-year period. Since the current rates of duty disability are already very low, we are not recommending a change in the rates of disability at this time.

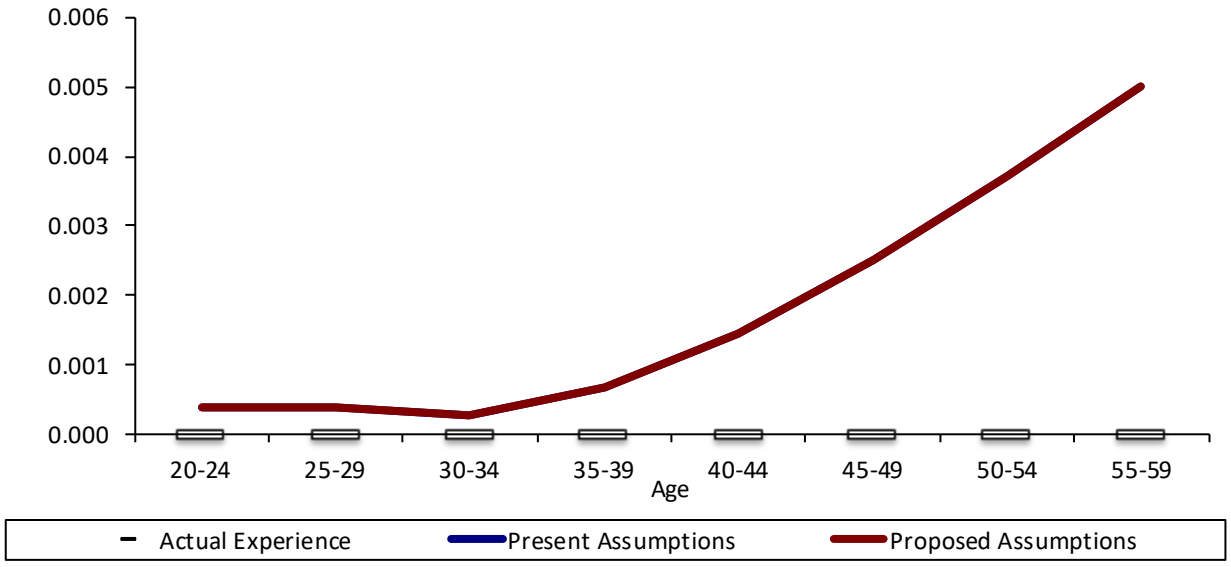
Age	Headcount Weighted Disabilities	Liability Weighted Disabilities	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Disabilities	
					Present	Proposed	Present	Proposed
Under 20	-	-	-	N/A	0.0003	0.0003	-	-
20-24	-	-	-	N/A	0.0003	0.0003	-	-
25-29	-	-	1.3	0.0000	0.0003	0.0003	-	-
30-34	-	-	9.7	0.0000	0.0002	0.0002	-	-
35-39	-	-	39.3	0.0000	0.0004	0.0004	-	-
40-44	-	-	103.9	0.0000	0.0009	0.0009	-	-
45-49	-	-	161.5	0.0000	0.0016	0.0016	1	1
50-54	-	-	252.1	0.0000	0.0023	0.0023	1	1
55-59	-	-	125.3	0.0000	0.0031	0.0031	-	-
Totals	-	-	693.0	0.0000	0.0029	0.0029	2	2



Duty Disability - Airport – Public Safety
Plan 5 Only

There were 0.0 liability weighted duty disability benefit claims reported for the 5-year period. Since the current rates of duty disability are already very low, we are not recommending a change in the rates of disability at this time.

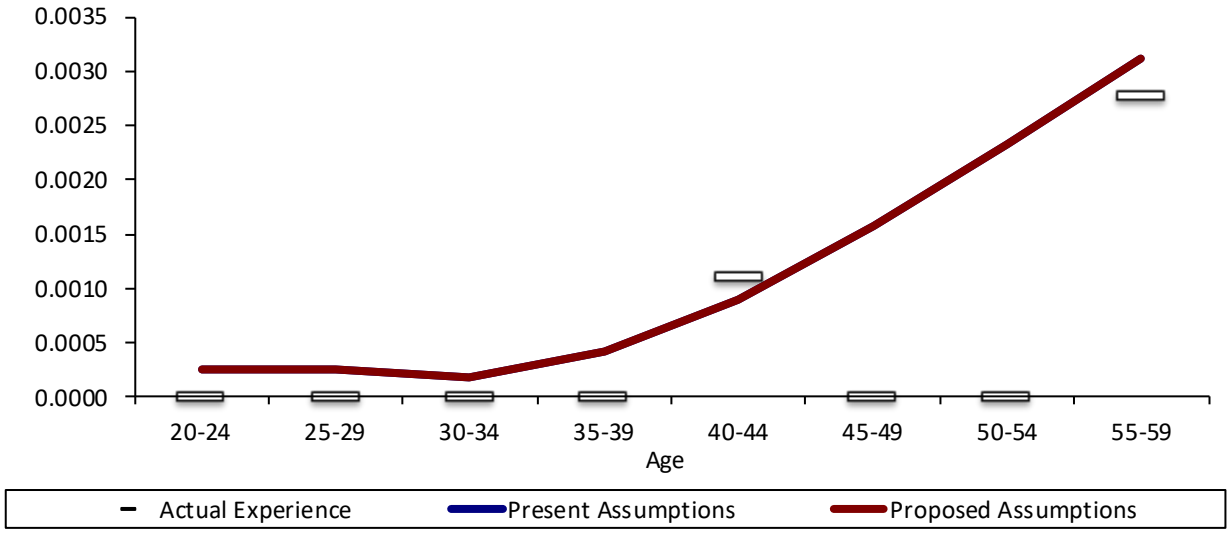
Age	Headcount Weighted Disabilities	Liability Weighted Disabilities	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Disabilities	
					Present	Proposed	Present	Proposed
Under 20	-	-	-	N/A	0.0004	0.0004	-	-
20-24	-	-	0.7	0.0000	0.0004	0.0004	-	-
25-29	-	-	1.6	0.0000	0.0004	0.0004	-	-
30-34	-	-	11.9	0.0000	0.0003	0.0003	-	-
35-39	-	-	35.1	0.0000	0.0007	0.0007	-	-
40-44	-	-	54.0	0.0000	0.0014	0.0014	-	-
45-49	-	-	182.9	0.0000	0.0025	0.0025	1	1
50-54	-	-	195.2	0.0000	0.0037	0.0037	1	1
55-59	-	-	40.6	0.0000	0.0050	0.0050	-	-
Totals	-	-	522.0	0.0000	0.0038	0.0038	2	2



Duty Disability – County – Non Public Safety
Plan 5 and 6 Only

There were 3.9 liability weighted duty disability benefit claims reported for the 5-year period. Since the current rates of duty disability are already very low, we are not recommending a change in the rates of disability at this time.

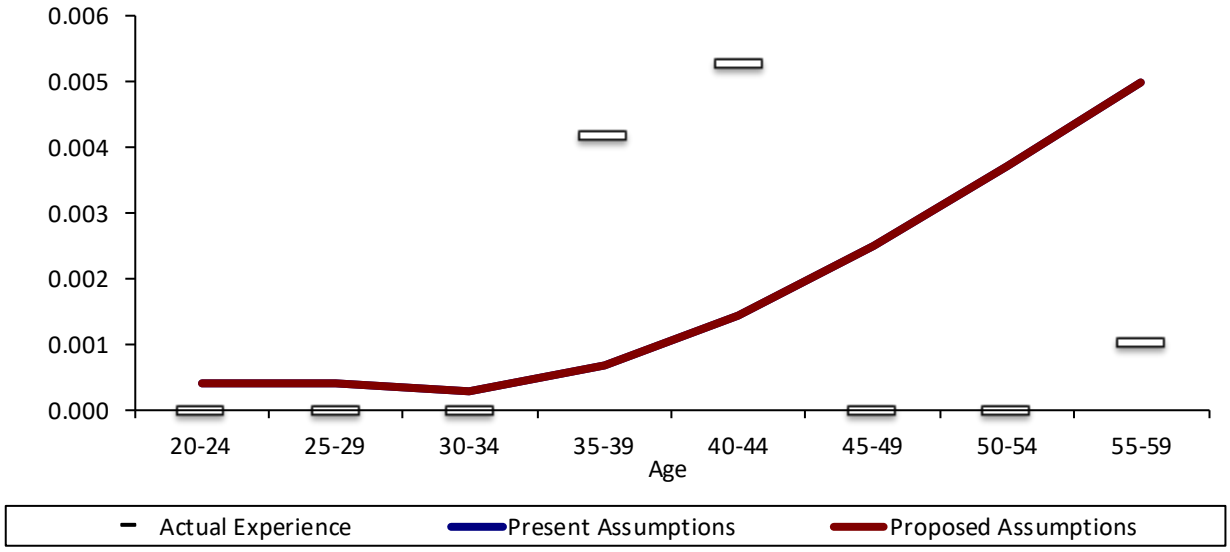
Age	Headcount Weighted Disabilities	Liability Weighted Disabilities	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Disabilities	
					Present	Proposed	Present	Proposed
Under 20	-	-	-	N/A	0.0003	0.0003	-	-
20-24	-	-	4.1	0.0000	0.0003	0.0003	-	-
25-29	-	-	29.1	0.0000	0.0003	0.0003	-	-
30-34	-	-	73.8	0.0000	0.0002	0.0002	-	-
35-39	-	-	246.3	0.0000	0.0004	0.0004	-	-
40-44	1	0.6	518.4	0.0011	0.0009	0.0009	-	-
45-49	-	-	952.4	0.0000	0.0016	0.0016	1	1
50-54	-	-	1,689.9	0.0000	0.0023	0.0023	1	1
55-59	2	3.3	1,189.0	0.0028	0.0031	0.0031	-	-
Totals	3	3.9	4,703.0	0.0008	0.0004	0.0004	2	2



Duty Disability - County – Public Safety
Plan 5 and 6 Only

There were 2.8 liability weighted duty disability benefit claims reported for the 5-year period. Since the current rates of duty disability are already very low, we are not recommending a change in the rates of disability at this time.

Age	Headcount Weighted Disabilities	Liability Weighted Disabilities	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Disabilities	
					Present	Proposed	Present	Proposed
Under 20	-	-	-	N/A	0.0004	0.0004	-	-
20-24	-	-	5.0	0.0000	0.0004	0.0004	-	-
25-29	-	-	8.0	0.0000	0.0004	0.0004	-	-
30-34	-	-	29.2	0.0000	0.0003	0.0003	-	-
35-39	1	0.7	166.0	0.0042	0.0007	0.0007	-	-
40-44	2	2.0	372.9	0.0053	0.0014	0.0014	-	-
45-49	-	-	943.6	0.0000	0.0025	0.0025	1	1
50-54	-	-	1,080.5	0.0000	0.0037	0.0037	1	1
55-59	1	0.2	172.8	0.0010	0.0050	0.0050	-	-
Totals	4	2.8	2,778.0	0.0010	0.0007	0.0007	2	2



Section I

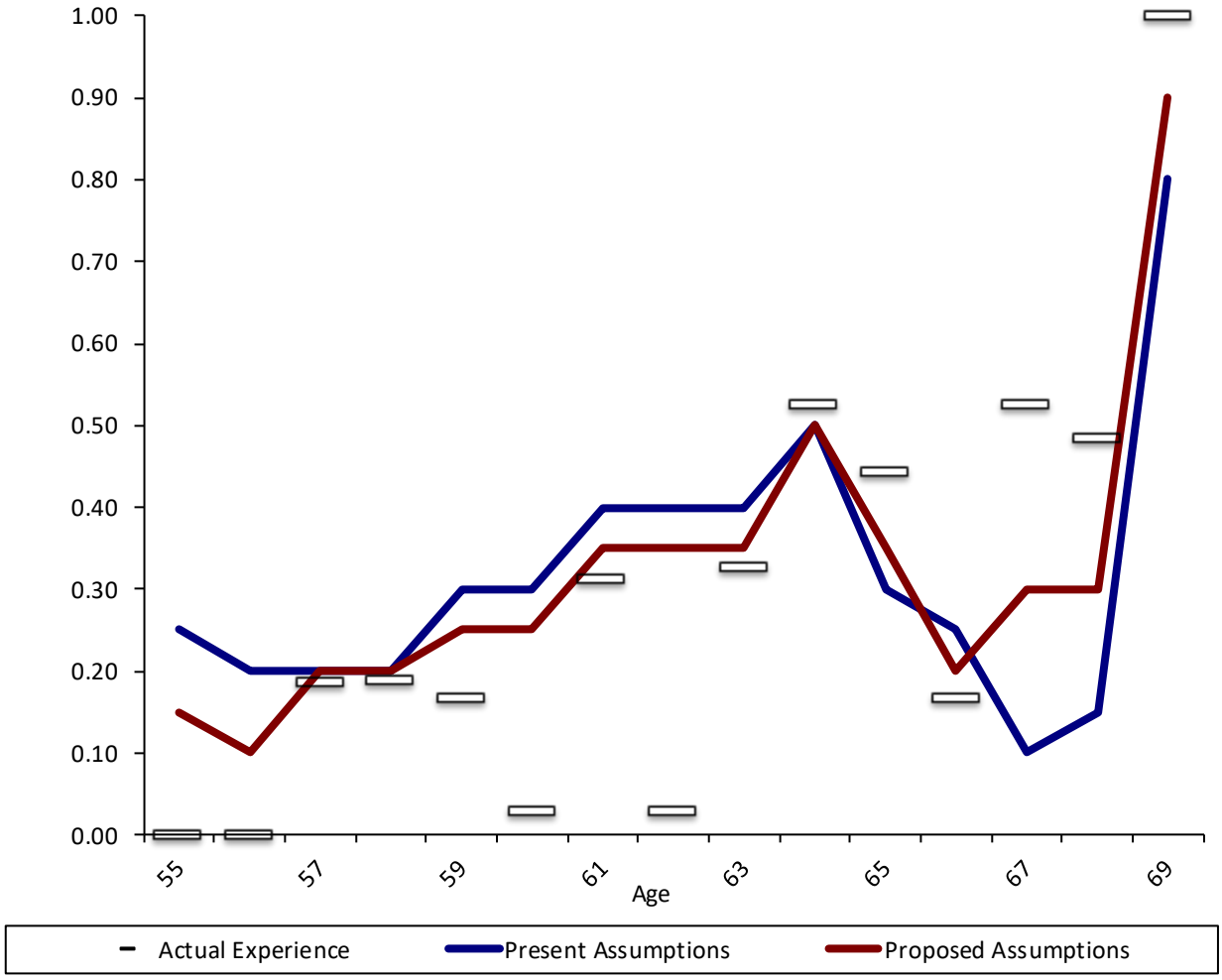
Retirement Experience

Airport – Non Public Safety
Age & Service
Plan 5 Only

Although males and females were studied separately, the proposed rates are applied to all members. Slight modifications are being suggested.

Age	Headcount Weighted Retirement	Liability Weighted Retirements	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
55	-	-	17.8	0.0000	0.2500	0.1500	4	3
56	-	-	21.3	0.0000	0.2000	0.1000	4	2
57	3	4.3	22.9	0.1878	0.2000	0.2000	5	5
58	3	3.5	18.2	0.1901	0.2000	0.2000	4	4
59	2	2.9	16.9	0.1687	0.3000	0.2500	5	4
60	1	0.6	22.2	0.0290	0.3000	0.2500	7	6
61	5	6.5	20.8	0.3138	0.4000	0.3500	8	7
62	1	0.4	12.4	0.0288	0.4000	0.3500	5	4
63	4	4.5	13.8	0.3275	0.4000	0.3500	6	5
64	2	3.8	7.2	0.5263	0.5000	0.5000	4	4
65	7	5.0	11.2	0.4432	0.3000	0.3500	3	4
66	3	1.1	6.7	0.1681	0.2500	0.2000	2	1
67	3	3.3	6.3	0.5252	0.1000	0.3000	1	2
68	4	1.3	2.6	0.4844	0.1500	0.3000	-	1
69	1	0.2	0.2	1.0000	0.8000	0.9000	-	-
70	1	0.5	0.5	1.0000	1.0000	1.0000	-	-
71	-	-	-	N/A	1.0000	1.0000	-	-
72	-	-	-	N/A	1.0000	1.0000	-	-
73	-	-	-	N/A	1.0000	1.0000	-	-
74	-	-	-	N/A	1.0000	1.0000	-	-
Totals	40	37.8	201.0	0.1881	0.2886	0.2587	58	52
75 & Over	-	-	-	N/A			-	-
Total	40	37.8	201.0	0.1881	0.2886	0.2587	58	52

Airport – Non Public Safety
Age & Service
Plan 5 Only

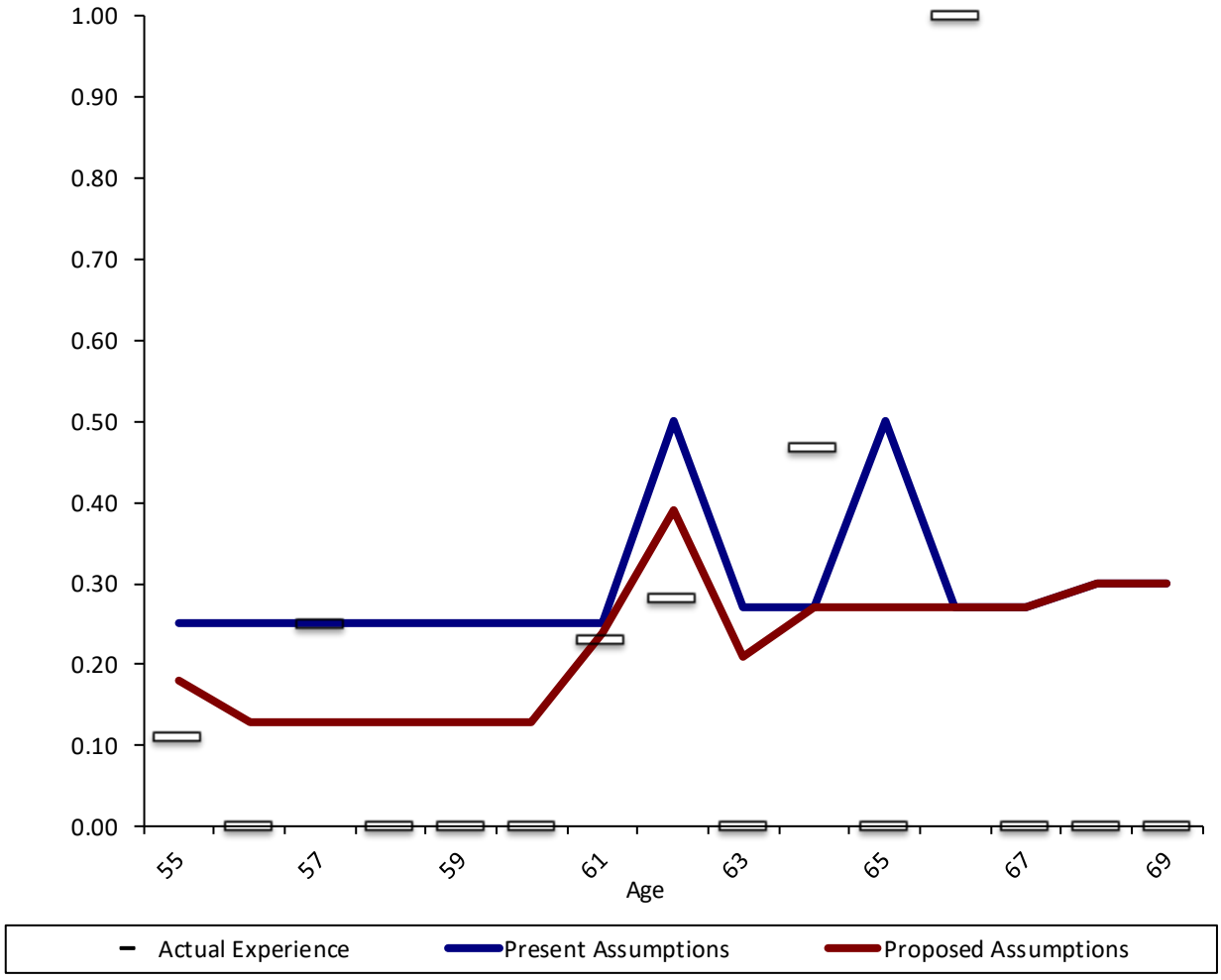


Airport – Public Safety
Age & Service
Plan 5 Only

Although males and females were studied separately, the proposed rates are applied to all members. Slight modifications are being suggested.

Age	Headcount Weighted Retirement	Liability Weighted Retirements	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
55	1	1.1	9.6	0.1117	0.2500	0.1800	2	2
56	-	-	4.1	0.0000	0.2500	0.1300	1	1
57	1	1.6	6.3	0.2493	0.2500	0.1300	2	1
58	-	-	6.3	0.0000	0.2500	0.1300	2	1
59	-	-	3.8	0.0000	0.2500	0.1300	1	-
60	-	-	4.2	0.0000	0.2500	0.1300	1	1
61	1	1.4	6.0	0.2314	0.2500	0.2400	1	1
62	1	1.0	3.7	0.2822	0.5000	0.3900	2	1
63	-	-	1.8	0.0000	0.2700	0.2100	-	-
64	1	0.9	2.0	0.4669	0.2700	0.2700	1	1
65	-	-	1.2	0.0000	0.5000	0.2700	1	-
66	1	1.1	1.1	1.0000	0.2700	0.2700	-	-
67	-	-	-	N/A	0.2700	0.2700	-	-
68	-	-	-	N/A	0.3000	0.3000	-	-
69	-	-	-	N/A	0.3000	0.3000	-	-
70	-	-	-	N/A	1.0000	1.0000	-	-
71	-	-	-	N/A	1.0000	1.0000	-	-
72	-	-	-	N/A	1.0000	1.0000	-	-
73	-	-	-	N/A	1.0000	1.0000	-	-
74	-	-	-	N/A	1.0000	1.0000	-	-
Totals	6	7.1	50.0	0.1428	0.2800	0.1800	14	9
75 & Over	-	-	-	N/A			-	
Total	6	7.1	50.0	0.1428	0.2800	0.1800	14	9

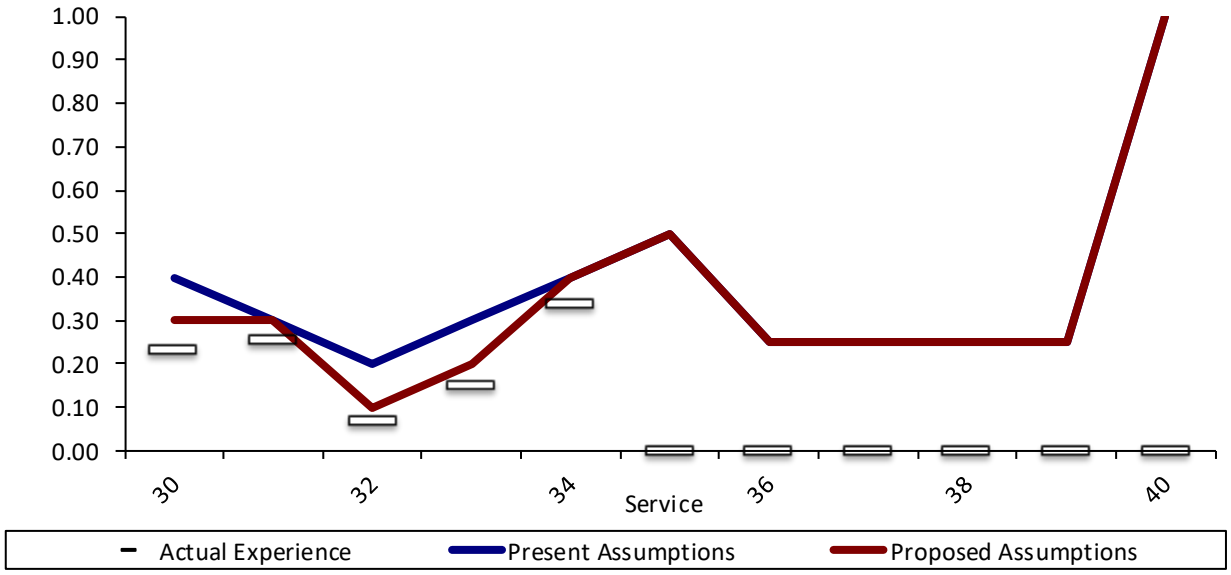
Airport – Public Safety
Age & Service
Plan 5 Only



Airport – Public Safety
Service Based
Plan 5 Only

Although males and females were studied separately, the proposed rates are applied to all members. Slight modifications are being recommended.

Service Years	Headcount Weighted Retirement	Liability Weighted Retirements	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
30	4	4.1	17.6	0.2322	0.4000	0.3000	7	5
31	4	3.7	14.3	0.2594	0.3000	0.3000	4	4
32	1	0.7	10.5	0.0682	0.2000	0.1000	2	1
33	1	1.3	8.7	0.1526	0.3000	0.2000	3	2
34	2	2.3	6.9	0.3408	0.4000	0.4000	3	3
35	-	-	-	N/A	0.5000	0.5000	-	-
36	-	-	-	N/A	0.2500	0.2500	-	-
37	-	-	-	N/A	0.2500	0.2500	-	-
38	-	-	-	N/A	0.2500	0.2500	-	-
39	-	-	-	N/A	0.2500	0.2500	-	-
40	-	-	-	N/A	1.0000	1.0000	-	-
Totals	12	12.2	58.0	0.2102	0.3276	0.2586	19	15

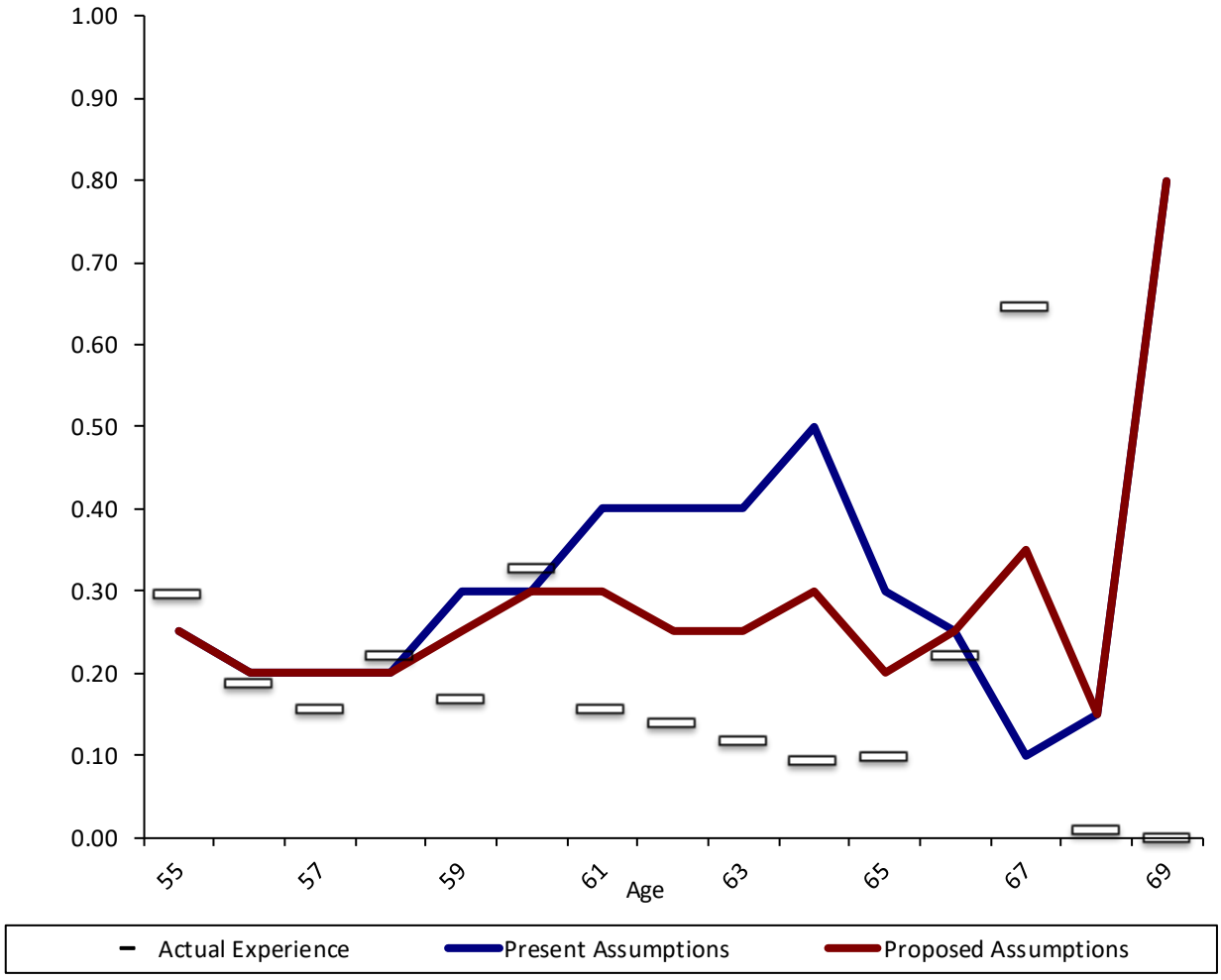


County – Non Public Safety
Age & Service
Plan 5 and 6 Only

Although males and females were studied separately, the proposed rates are applied to all members. Slight modifications are being suggested (with the exception of the early retirement rates, for which we are not recommending a change to early retirement rates at this time).

Age	Headcount Weighted Retirement	Liability Weighted Retirements	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
55	10	12.8	43.5	0.2953	0.2500	0.2500	11	11
56	6	6.5	34.7	0.1877	0.2000	0.2000	7	7
57	7	5.4	35.0	0.1549	0.2000	0.2000	7	7
58	5	6.8	30.8	0.2215	0.2000	0.2000	6	6
59	7	5.7	34.3	0.1667	0.3000	0.2500	10	9
60	17	17.1	52.3	0.3261	0.3000	0.3000	16	16
61	8	6.3	40.6	0.1558	0.4000	0.3000	16	12
62	6	9.3	66.4	0.1393	0.4000	0.2500	27	17
63	8	5.7	48.3	0.1181	0.4000	0.2500	19	12
64	5	4.0	42.4	0.0937	0.5000	0.3000	21	13
65	9	2.2	22.4	0.0985	0.3000	0.2000	7	4
66	7	4.0	18.1	0.2222	0.2500	0.2500	5	5
67	7	12.0	18.6	0.6451	0.1000	0.3500	2	7
68	1	0.0	4.1	0.0095	0.1500	0.1500	1	1
69	-	-	4.5	0.0000	0.8000	0.8000	4	4
70	1	0.0	2.7	0.0088	1.0000	1.0000	3	3
71	-	-	2.7	0.0000	1.0000	1.0000	3	3
72	1	0.6	4.1	0.1564	1.0000	1.0000	4	4
73	-	-	5.7	0.0000	1.0000	1.0000	6	6
74	-	-	6.9	0.0000	1.0000	1.0000	7	7
Totals	105	98.5	518.0	0.1902	0.3514	0.2500	182	154
75 & Over	4	4.4	8.5	0.5174			9	9
Total	109	102.9	526.5	0.1955	0.3618	0.3087	191	163

County – Non Public Safety
Age & Service
Plan 5 and 6 Only

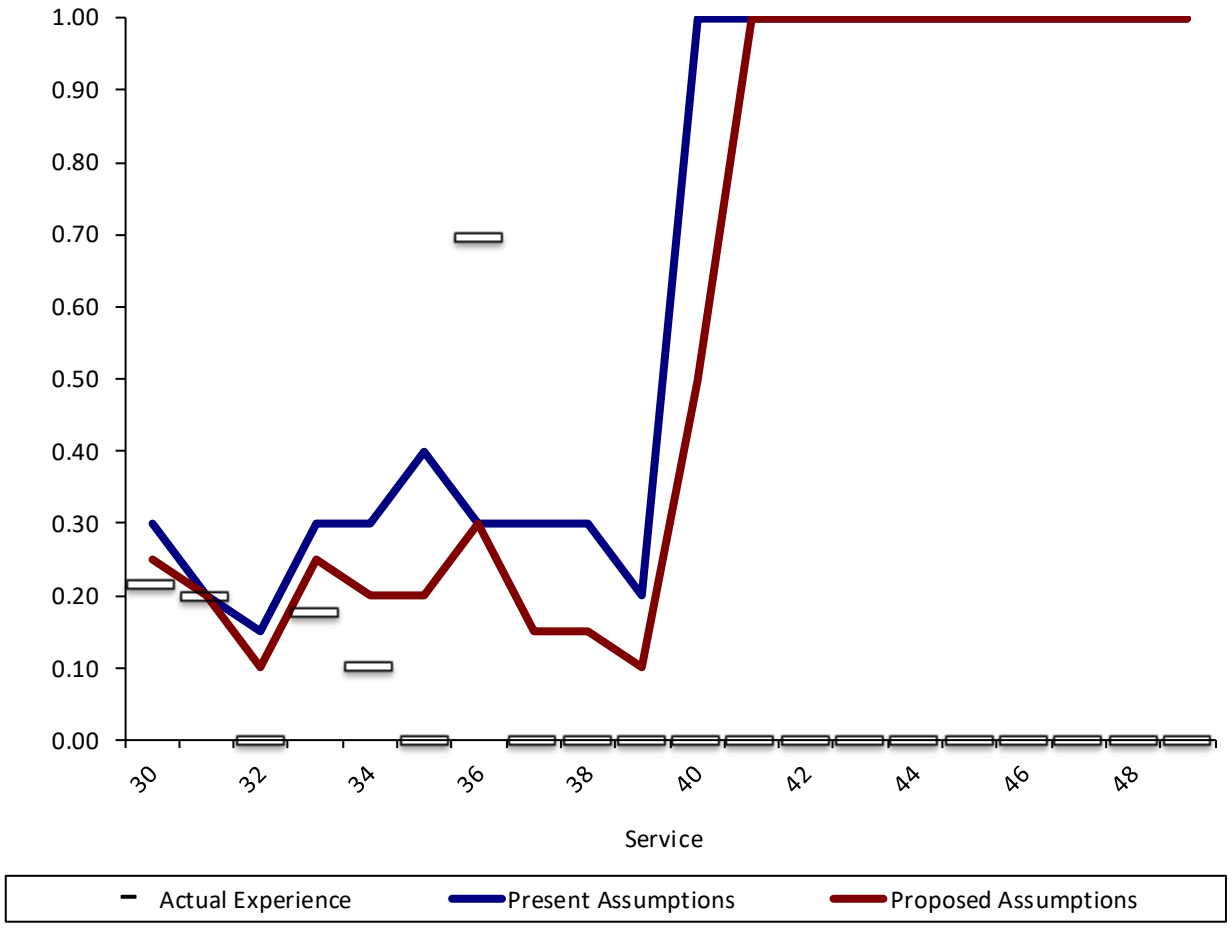


County – Non Public Safety
Service Based
Plan 5 and 6 Only

Although males and females were studied separately, the proposed rates are applied to all members. Slight modifications are being recommended.

Service Years	Headcount Weighted Retirement	Liability Weighted Retirements	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
30	3	5.6	26.1	0.2152	0.3000	0.2500	8	7
31	3	4.3	21.5	0.1993	0.2000	0.2000	4	4
32	-	-	20.8	0.0000	0.1500	0.1000	3	2
33	2	3.0	16.8	0.1780	0.3000	0.2500	5	4
34	1	1.0	9.7	0.1018	0.3000	0.2000	3	2
35	-	-	5.0	0.0000	0.4000	0.2000	2	1
36	1	1.7	2.4	0.6959	0.3000	0.3000	1	1
37	-	-	1.2	0.0000	0.3000	0.1500	-	-
38	-	-	1.4	0.0000	0.3000	0.1500	-	-
39	-	-	1.5	0.0000	0.2000	0.1000	-	-
40	-	-	1.6	0.0000	1.0000	0.5000	2	1
41	-	-	-	N/A	1.0000	1.0000	-	-
42	-	-	-	N/A	1.0000	1.0000	-	-
43	-	-	-	N/A	1.0000	1.0000	-	-
44	-	-	-	N/A	1.0000	1.0000	-	-
45	-	-	-	N/A	1.0000	1.0000	-	-
46	-	-	-	N/A	1.0000	1.0000	-	-
47	-	-	-	N/A	1.0000	1.0000	-	-
48	-	-	-	N/A	1.0000	1.0000	-	-
49	-	-	-	N/A	1.0000	1.0000	-	-
Other	-	-	-	N/A			-	-
Totals	10	15.6	108.0	0.1440	0.2593	0.2037	28	22

County – Non Public Safety
Service Based
Plan 5 and 6 Only

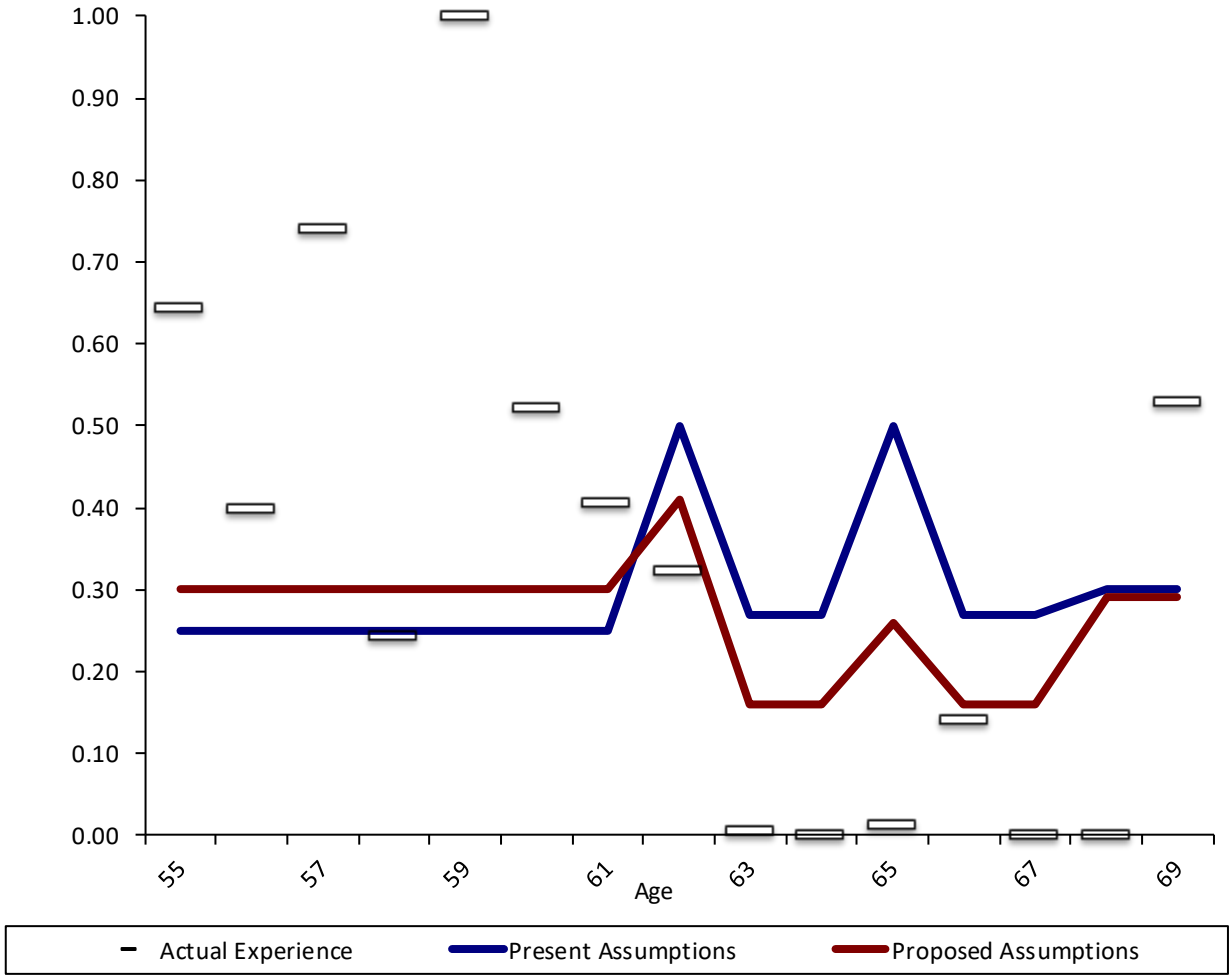


County – Public Safety
Age & Service
Plan 5 and 6 Only

Although males and females were studied separately, the proposed rates are applied to all members. Slight modifications are being suggested.

Age	Headcount Weighted Retirement	Liability Weighted Retirements	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
55	20	22.5	35.1	0.6429	0.2500	0.3000	9	11
56	5	6.3	15.8	0.3985	0.2500	0.3000	4	5
57	9	5.4	7.3	0.7406	0.2500	0.3000	2	2
58	3	1.4	5.8	0.2424	0.2500	0.3000	1	2
59	1	0.0	0.0	1.0000	0.2500	0.3000	-	-
60	3	2.6	5.0	0.5235	0.2500	0.3000	1	2
61	1	1.7	4.2	0.4055	0.2500	0.3000	1	1
62	1	1.5	4.7	0.3245	0.5000	0.4100	2	2
63	1	0.0	1.9	0.0058	0.2700	0.1600	1	-
64	-	-	2.3	0.0000	0.2700	0.1600	1	-
65	2	0.0	2.4	0.0129	0.5000	0.2600	1	1
66	1	0.3	2.1	0.1408	0.2700	0.1600	1	-
67	-	-	0.9	0.0000	0.2700	0.1600	-	-
68	-	-	0.3	0.0000	0.3000	0.2900	-	-
69	1	0.2	0.3	0.5299	0.3000	0.2900	-	-
70	-	-	0.9	0.0000	1.0000	1.0000	1	1
71	-	-	-	N/A	1.0000	1.0000	-	-
72	-	-	-	N/A	1.0000	1.0000	-	-
73	-	-	-	N/A	1.0000	1.0000	-	-
74	-	-	-	N/A	1.0000	1.0000	-	-
Totals	48	42.0	89.0	0.4722	0.3034	0.3034	27	27
75 & Over	-	-	-	N/A			-	-
Total	48	42.0	89.0	0.4722	0.3034	0.3034	27	27

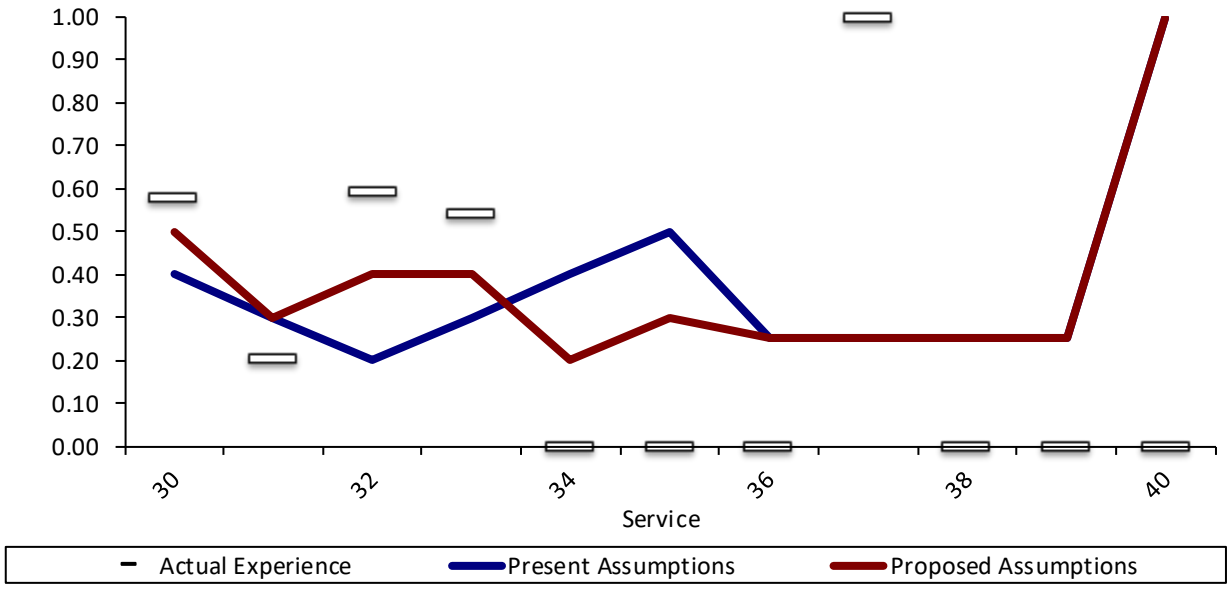
County – Public Safety
Age & Service
Plan 5 and 6 Only



County – Public Safety
Service Based
Plan 5 and 6 Only

Although males and females were studied separately, the proposed rates are applied to all members. Slight modifications are being recommended.

Service Years	Headcount Weighted Retirement	Liability Weighted Retirements	Liability Weighted Exposure	Crude Rates	Sample Rates		Expected Retirements	
					Present	Proposed	Present	Proposed
30	16	17.4	30.0	0.5805	0.4000	0.5000	12	15
31	2	2.6	12.8	0.2024	0.3000	0.3000	4	4
32	4	4.1	6.9	0.5953	0.2000	0.4000	1	3
33	1	1.3	2.3	0.5439	0.3000	0.4000	1	1
34	-	-	0.9	0.0000	0.4000	0.2000	-	-
35	-	-	2.0	0.0000	0.5000	0.3000	1	1
36	-	-	1.0	0.0000	0.2500	0.2500	-	-
37	1	1.1	1.1	1.0000	0.2500	0.2500	-	-
38	-	-	-	N/A	0.2500	0.2500	-	-
39	-	-	-	N/A	0.2500	0.2500	-	-
40	-	-	-	N/A	1.0000	1.0000	-	-
Totals	24	26.4	57.0	0.4637	0.3333	0.4211	19	24



Section J

Salary Increases

Airport – Non Public Safety
Age-Based Merit & Longevity
Plan 5 Only

Age Group Beginning of Year	Liability Weighted Number	Merit/Seniority % Increase		
			Sample Values	
		Actual	Present	Proposed
Under 25	-	N/A	4.30 %	4.30 %
25-29	3	1.41 %	3.25 %	2.33 %
30-34	12	1.92 %	1.90 %	1.91 %
35-39	63	1.75 %	1.65 %	1.70 %
40-44	144	0.43 %	1.45 %	1.40 %
45-49	206	3.51 %	1.05 %	1.23 %
50-54	352	0.96 %	1.03 %	0.99 %
55-59	502	(0.01)%	0.51 %	0.25 %
60-64	291	(0.07)%	0.36 %	0.15 %
65 & Over	55	0.69 %	0.00 %	0.00 %
Total	1,629			

The above sample values are net of estimate market scale adjustments. Rates of increase are being modified to partially match experience.

Airport – Public Safety
Service-Based Merit & Longevity
Plan 5 Only

Service Index	Liability Weighted Number	Merit/Seniority % Increase		
			Sample Values	
		Actual	Present	Proposed
1	0.82	31.04 %	10.15 %	10.150 %
2	1.80	24.24 %	9.50 %	9.500 %
3	2.55	11.50 %	8.84 %	8.835 %
4	3.70	3.37 %	8.17 %	8.170 %
5	2.37	7.15 %	7.51 %	7.505 %
6	1.99	(0.77)%	4.34 %	4.340 %
7	1.40	6.01 %	3.18 %	3.175 %
8	0.64	(6.18)%	1.97 %	2.250 %
9	5.51	(7.62)%	1.86 %	1.950 %
10	10.11	10.12 %	1.75 %	1.800 %
11	12.55	4.59 %	1.54 %	1.750 %
12	17.32	8.81 %	1.43 %	1.28 %
13	22.04	(10.58)%	1.35 %	1.20 %
14	19.15	(0.88)%	1.31 %	1.16 %
15	13.69	9.26 %	1.27 %	1.12 %
16	24.15	8.09 %	1.23 %	1.03 %
17	31.48	0.33 %	1.19 %	0.99 %
18	32.27	(1.14)%	1.17 %	0.97 %
19	40.00	0.72 %	1.16 %	0.96 %
20	49.81	1.48 %	3.75 %	3.55 %
21	57.45	(1.39)%	0.94 %	0.54 %
22	65.34	2.25 %	0.83 %	0.43 %
23	86.36	4.34 %	0.77 %	0.37 %
24	95.18	(4.17)%	0.75 %	0.35 %
25	95.84	(3.22)%	0.73 %	0.33 %
26	86.08	4.13 %	0.71 %	0.31 %
27	69.90	(4.39)%	0.69 %	0.29 %
28	79.08	(5.23)%	0.66 %	0.26 %
29	89.50	5.56 %	0.00 %	0.00 %
30	113.87	(0.93)%	0.00 %	0.00 %
31	79.61	0.62 %	0.00 %	0.00 %
32	73.33	(0.41)%	0.00 %	0.00 %
33	55.16	(6.94)%	0.00 %	0.00 %
34	29.85	(2.41)%	0.00 %	0.00 %
35	-	N/A	0.00 %	0.00 %
36	-	N/A	0.00 %	0.00 %
37	-	N/A	0.00 %	0.00 %
38	-	N/A	0.00 %	0.00 %
39	-	N/A	0.00 %	0.00 %
40	-	N/A	0.00 %	0.00 %
Other	-			
Total	1,369.90			

The above sample values are net of estimate market scale adjustments. Rates of increase are being modified to partially match experience.

County – Non Public Safety
Age-Based Merit & Longevity
Plan 5 and 6 Only

Age Group Beginning of Year	Liability Weighted Number	Merit/Seniority % Increase		
			Sample Values	
		Actual	Present	Proposed
Under 25	2	1.00 %	4.15 %	4.15 %
25-29	10	2.65 %	3.63 %	3.63 %
30-34	24	4.23 %	2.45 %	2.45 %
35-39	101	1.70 %	1.83 %	1.78 %
40-44	182	1.41 %	1.23 %	1.33 %
45-49	472	0.89 %	1.03 %	0.98 %
50-54	791	0.73 %	0.85 %	0.80 %
55-59	803	0.14 %	0.43 %	0.28 %
60-64	422	(0.02)%	0.33 %	0.18 %
65 & Over	129	(1.81)%	0.00 %	0.00 %
Total	2,935			

The above sample values are net of estimate market scale adjustments. Rates of increase are being modified to partially match experience.

County – Public Safety
Service-Based Merit & Longevity
Plan 5 and 6 Only

Service Index	Liability Weighted Number	Merit/Seniority % Increase		
			Sample Values	
		Actual	Present	Proposed
1	3	2.13 %	9.15 %	8.35 %
2	5	4.47 %	8.50 %	7.70 %
3	4	6.22 %	7.84 %	7.04 %
4	4	7.10 %	7.17 %	6.37 %
5	3	10.50 %	6.51 %	5.71 %
6	3	8.45 %	4.34 %	5.09 %
7	3	9.25 %	3.18 %	3.93 %
8	7	4.13 %	1.97 %	2.72 %
9	9	2.95 %	1.86 %	2.61 %
10	13	1.52 %	1.75 %	1.45 %
11	21	0.08 %	1.64 %	1.34 %
12	28	0.44 %	1.53 %	1.23 %
13	32	1.41 %	1.45 %	1.15 %
14	25	2.72 %	1.41 %	1.11 %
15	47	0.06 %	1.37 %	1.07 %
16	77	0.27 %	1.33 %	1.03 %
17	96	0.83 %	1.29 %	0.99 %
18	85	0.56 %	1.27 %	0.97 %
19	69	0.45 %	1.26 %	0.96 %
20	66	1.26 %	1.25 %	0.95 %
21	66	1.87 %	0.99 %	0.89 %
22	102	(0.16)%	0.98 %	0.88 %
23	137	0.33 %	0.82 %	0.72 %
24	170	0.69 %	0.80 %	0.70 %
25	168	0.85 %	0.78 %	0.68 %
26	214	0.36 %	0.76 %	1.01 %
27	231	0.72 %	0.74 %	0.99 %
28	260	2.22 %	0.71 %	0.96 %
29	213	1.28 %	0.69 %	0.94 %
30	178	1.23 %	0.67 %	0.67 %
31	93	2.91 %	0.65 %	0.65 %
32	19	1.54 %	0.63 %	0.63 %
33	11	(0.54)%	0.58 %	0.58 %
34	10	0.31 %	0.51 %	0.51 %
35	5	1.70 %	0.44 %	0.44 %
36	5	N/A	0.37 %	0.37 %
37	-	N/A	0.30 %	0.30 %
38	-	N/A	0.10 %	0.10 %
39	-	N/A	0.10 %	0.10 %
40	-	N/A	0.10 %	0.10 %
Other	-			
Total	2,485			

The above sample values are net of estimate market scale adjustments. Rates of increase are being modified to partially match experience.

Section K

Summary of Proposed Assumptions

Withdrawal

Less than 5 Years of Service				
Service	Airport		County	
Index	Non Public Safety	Public Safety	Non Public Safety	Public Safety
1	0.1900	0.1800	0.2500	0.1400
2	0.1600	0.1800	0.1900	0.0850
3	0.1200	0.0900	0.1600	0.0650
4	0.1100	0.0700	0.1500	0.0450
5	0.1000	0.0600	0.1300	0.0360
Sw	759	760	1052	1053

5 or more Years of Service				
Age	Non Public Safety	Public Safety	Non Public Safety	Public Safety
25	0.0935	0.0403	0.0935	0.0482
26	0.0930	0.0399	0.0930	0.0477
27	0.0925	0.0396	0.0925	0.0473
28	0.0838	0.0362	0.0838	0.0433
29	0.0751	0.0329	0.0751	0.0394
30	0.0665	0.0296	0.1075	0.0354
31	0.0665	0.0263	0.1075	0.0315
32	0.0665	0.0230	0.1075	0.0275
33	0.0665	0.0228	0.1075	0.0273
34	0.0665	0.0226	0.1075	0.0271
35	0.0520	0.0224	0.0670	0.0268
36	0.0520	0.0223	0.0670	0.0266
37	0.0520	0.0221	0.0670	0.0264
38	0.0520	0.0219	0.0670	0.0262
39	0.0520	0.0217	0.0670	0.0260
40	0.0510	0.0215	0.0565	0.0257
41	0.0510	0.0213	0.0565	0.0255
42	0.0510	0.0212	0.0565	0.0253
43	0.0510	0.0206	0.0565	0.0246
44	0.0510	0.0201	0.0565	0.0240
45	0.0369	0.0195	0.0565	0.0233
46	0.0349	0.0190	0.0565	0.0227
47	0.0327	0.0184	0.0565	0.0220
48	0.0317	0.0175	0.0565	0.0209
49	0.0307	0.0166	0.0565	0.0198
50	0.0307	0.0156	0.0517	0.0187
51	0.0297	0.0147	0.0507	0.0176
52	0.0289	0.0138	0.0499	0.0165
53	0.0279	0.0129	0.0489	0.0154
54	0.0269	0.0120	0.0479	0.0143
Wx	1566	1230	1567	1230
Wx Mult	100%	92%	100%	110%

Disability

Age	% Becoming Disabled	
	Non Public Safety	Public Safety
20	0.08%	0.10%
21	0.08%	0.10%
22	0.08%	0.10%
23	0.08%	0.10%
24	0.08%	0.10%
25	0.08%	0.10%
26	0.08%	0.10%
27	0.08%	0.10%
28	0.07%	0.09%
29	0.06%	0.08%
30	0.05%	0.07%
31	0.05%	0.07%
32	0.05%	0.07%
33	0.06%	0.08%
34	0.08%	0.10%
35	0.09%	0.12%
36	0.11%	0.14%
37	0.13%	0.17%
38	0.15%	0.20%
39	0.18%	0.24%
40	0.21%	0.28%
41	0.24%	0.32%
42	0.27%	0.36%
43	0.31%	0.41%
44	0.35%	0.46%
45	0.38%	0.51%
46	0.43%	0.57%
47	0.47%	0.63%
48	0.52%	0.69%
49	0.56%	0.75%
50	0.61%	0.81%
51	0.65%	0.87%
52	0.70%	0.93%
53	0.75%	1.00%
54	0.80%	1.06%
55	0.85%	1.13%
56	0.89%	1.19%
57	0.94%	1.25%
58	0.99%	1.32%
59	1.04%	1.38%
60	1.08%	1.44%
Hx	8	8
Mult	75%	100%

For Non Public Safety Members, two-thirds of disabilities are assumed to be non-duty related and the remaining one-third are assumed to be duty related. For Public Safety Members, 60% are assumed to be non-duty related and the remaining 40% are assumed to be duty related.

Salary Scale – Non Public Safety

% Merit Increases in Salaries Next Year		
Age	County (Excluding Airport)	Airport
20	4.2%	4.4%
21	4.2%	4.3%
22	4.2%	4.3%
23	4.1%	4.1%
24	4.0%	4.0%
25	3.9%	3.8%
26	3.8%	3.5%
27	3.6%	3.3%
28	3.4%	3.0%
29	3.2%	2.7%
30	2.9%	2.4%
31	2.7%	2.2%
32	2.5%	1.9%
33	2.3%	1.8%
34	2.2%	1.8%
35	2.1%	1.7%
36	1.9%	1.7%
37	1.8%	1.7%
38	1.7%	1.6%
39	1.6%	1.6%
40	1.5%	1.6%
41	1.4%	1.5%
42	1.2%	1.5%
43	1.2%	1.4%
44	1.2%	1.3%
45	1.1%	1.2%
46	1.1%	1.2%
47	1.0%	1.1%
48	1.0%	1.1%
49	1.0%	1.1%
50	0.9%	1.1%
51	0.9%	1.0%
52	0.9%	1.0%
53	0.8%	1.0%
54	0.7%	0.9%
55	0.6%	0.9%
56	0.5%	0.8%
57	0.4%	0.5%
58	0.4%	0.5%
59	0.4%	0.5%
60	0.4%	0.4%
Ref	480	481

Salary Scale – Public Safety

% Merit Increases in Salaries Next Year		
Service Index	County (Excluding Airport)	Airport
1	9.2%	10.2%
2	8.5%	9.5%
3	7.8%	8.8%
4	7.2%	8.2%
5	6.5%	7.5%
6	4.3%	4.3%
7	3.2%	3.2%
8	2.0%	2.0%
9	1.9%	1.9%
10	1.7%	1.7%
11	1.6%	1.5%
12	1.5%	1.4%
13	1.4%	1.3%
14	1.4%	1.3%
15	1.4%	1.3%
16	1.3%	1.2%
17	1.3%	1.2%
18	1.3%	1.2%
19	1.3%	1.2%
20	1.2%	3.7%
21	1.0%	0.9%
22	1.0%	0.8%
23	0.8%	0.8%
24	0.8%	0.8%
25	0.8%	0.7%
26	0.8%	0.7%
27	0.7%	0.7%
28	0.7%	0.7%
29	0.7%	0.0%
30	0.7%	0.0%
31	0.6%	0.0%
32	0.6%	0.0%
33	0.6%	0.0%
34	0.5%	0.0%
35	0.4%	0.0%
36	0.4%	0.0%
37	0.3%	0.0%
38	0.1%	0.0%
39	0.1%	0.0%
40	0.1%	0.0%
Ref	703	704

Retirement Pattern

	Regular Retirement		Early Retirement
Age	Non Public Safety	Public Safety	Non Public Safety
55	25%	25%	5%
56	20%	25%	6%
57	20%	25%	7%
58	20%	25%	8%
59	30%	25%	9%
60	30%	25%	10%
61	40%	25%	10%
62	40%	50%	
63	40%	27%	
64	50%	27%	
65	30%	50%	
66	25%	27%	
67	10%	27%	
68	15%	30%	
69	80%	30%	
70	100%	100%	
Rx	2661	2659	2658
anchor	55	55	55

	Regular Retirement	
Service	Non Public Safety	Public Safety
30	30%	40%
31	20%	30%
32	15%	20%
33	30%	30%
34	30%	40%
35	40%	50%
36	30%	25%
37	30%	25%
38	30%	25%
39	20%	25%
40	100%	100%
Rx	2120	2660
anchor	30	30

Rates were increased to 35% for non-public safety and 40% for public safety once a member reached the maximum benefit of 75% of FAC.

For members that are at least 42 as of September 30, 2015, have at least 10 years of service as of September 30, 2015 and entered the plan before age 42, the retirement pattern is applied when the member is eligible for the frozen benefit. For all other members, the retirement pattern is applied when the member is eligible for the new, non-frozen, benefit.

Retired Healthy Lives Mortality Rates

Age	% Dying Next Year	
	Male	Female
50	0.2946%	0.2238%
51	0.3185%	0.2381%
52	0.3458%	0.2557%
53	0.3755%	0.2740%
54	0.4098%	0.2930%
55	0.4464%	0.3128%
56	0.4865%	0.3332%
57	0.5294%	0.3544%
58	0.5748%	0.3752%
59	0.6239%	0.3982%
60	0.6738%	0.4233%
61	0.7252%	0.4522%
62	0.7798%	0.4853%
63	0.8359%	0.5242%
64	0.8973%	0.5673%
65	0.9663%	0.6181%
66	1.0456%	0.6764%
67	1.1374%	0.7434%
68	1.2437%	0.8223%
69	1.3670%	0.9141%
70	1.5090%	1.0198%
71	1.6707%	1.1421%
72	1.8578%	1.2829%
73	2.0693%	1.4432%
74	2.3127%	1.6262%
75	2.5909%	1.8334%
76	2.9072%	2.0666%
77	3.2678%	2.3318%
78	3.6777%	2.6322%
79	4.1433%	2.9729%
80	4.6731%	3.3621%
81	5.2748%	3.8061%
82	5.9583%	4.3128%
83	6.7238%	4.8903%
84	7.5809%	5.5506%
85	8.5325%	6.3032%

Age	% Dying Next Year	
	Male	Female
86	9.5775%	7.1610%
87	10.7159%	8.1288%
88	11.9579%	9.2131%
89	13.2990%	10.4068%
90	14.7374%	11.7039%
91	16.2584%	13.0727%
92	17.8528%	14.4948%
93	19.5061%	15.9746%
94	21.2141%	17.5078%
95	22.9719%	19.1020%
96	24.8566%	20.8298%
97	26.8232%	22.6650%
98	28.8559%	24.6059%
99	30.9492%	26.6574%
100	33.0659%	28.7962%
101	35.1989%	31.0017%
102	37.3253%	33.2268%
103	39.4170%	35.4614%
104	41.4649%	37.6711%
105	43.4440%	39.8478%
106	45.3502%	41.9619%
107	47.1836%	44.0148%
108	48.9175%	45.9884%
109	50.5766%	47.8599%
110	51.8837%	49.6355%
111	51.9981%	51.2995%
112	52.1232%	52.2171%
113	52.2433%	52.3061%
114	52.3689%	52.4004%
115	52.4842%	52.4895%
116	52.4948%	52.4948%
117	52.5000%	52.5000%
118	52.5000%	52.5000%
119	52.5000%	52.5000%
120	100.0000%	100.0000%
Ref	#2705sb0x1.05	#2706sb0x1.05

Retired Disabled Lives Mortality Rates

Age	% Dying Next Year	
	Male	Female
50	1.5111%	1.4237%
51	1.6176%	1.4943%
52	1.7301%	1.5711%
53	1.8466%	1.6524%
54	1.9659%	1.7356%
55	2.0852%	1.8145%
56	2.2023%	1.8858%
57	2.3133%	1.9457%
58	2.4186%	1.9929%
59	2.5180%	2.0276%
60	2.6116%	2.0534%
61	2.7001%	2.0709%
62	2.7886%	2.0879%
63	2.8795%	2.1068%
64	2.9726%	2.1318%
65	3.0684%	2.1667%
66	3.1701%	2.2158%
67	3.2779%	2.2824%
68	3.3964%	2.3697%
69	3.5269%	2.4798%
70	3.6738%	2.6148%
71	3.8428%	2.7754%
72	4.0366%	2.9644%
73	4.2572%	3.1806%
74	4.5087%	3.4297%
75	4.7965%	3.7120%
76	5.1188%	4.0297%
77	5.4827%	4.3872%
78	5.8890%	4.7865%
79	6.3445%	5.2312%
80	6.8502%	5.7246%
81	7.4120%	6.2697%
82	8.0308%	6.8681%
83	8.7052%	7.5257%
84	9.4398%	8.2432%
85	10.2298%	9.0273%

Age	% Dying Next Year	
	Male	Female
86	11.0784%	9.8440%
87	11.9856%	10.6758%
88	12.9671%	11.5213%
89	14.1949%	12.3764%
90	15.5480%	13.2600%
91	16.9311%	14.1810%
92	18.3260%	15.1580%
93	19.7229%	16.2196%
94	21.1334%	17.3777%
95	22.5748%	18.6495%
96	24.1468%	20.1078%
97	25.8241%	21.7465%
98	27.6106%	23.5109%
99	29.5120%	25.4094%
100	31.4913%	27.4250%
101	33.5228%	29.5254%
102	35.5479%	31.6446%
103	37.5400%	33.7728%
104	39.4904%	35.8772%
105	41.3752%	37.9503%
106	43.1907%	39.9637%
107	44.9368%	41.9189%
108	46.5881%	43.7985%
109	48.1682%	45.5809%
110	49.4130%	47.2719%
111	49.5220%	48.8567%
112	49.6411%	49.7306%
113	49.7555%	49.8153%
114	49.8751%	49.9051%
115	49.9850%	49.9900%
116	49.9950%	49.9950%
117	50.0000%	50.0000%
118	50.0000%	50.0000%
119	50.0000%	50.0000%
120	100.0000%	100.0000%
Ref	#2711sb0x1	#2712sb0x1

Death-in-Service Rates

Age	% Dying Next Year	
	Male	Female
20	0.0375%	0.0138%
21	0.0371%	0.0130%
22	0.0348%	0.0121%
23	0.0335%	0.0113%
24	0.0322%	0.0104%
25	0.0320%	0.0106%
26	0.0353%	0.0120%
27	0.0375%	0.0135%
28	0.0409%	0.0150%
29	0.0432%	0.0165%
30	0.0466%	0.0192%
31	0.0499%	0.0206%
32	0.0531%	0.0233%
33	0.0560%	0.0245%
34	0.0587%	0.0269%
35	0.0623%	0.0290%
36	0.0654%	0.0309%
37	0.0680%	0.0338%
38	0.0714%	0.0352%
39	0.0742%	0.0376%
40	0.0777%	0.0397%
41	0.0806%	0.0428%
42	0.0844%	0.0446%
43	0.0879%	0.0474%
44	0.0923%	0.0502%
45	0.0978%	0.0541%
46	0.1044%	0.0582%
47	0.1112%	0.0625%
48	0.1204%	0.0672%
49	0.1300%	0.0732%
50	0.1403%	0.0797%
51	0.1531%	0.0876%
52	0.1665%	0.0960%
53	0.1817%	0.1058%
54	0.1976%	0.1159%
55	0.2160%	0.1281%

Age	% Dying Next Year	
	Male	Female
56	0.2361%	0.1402%
57	0.2587%	0.1529%
58	0.2824%	0.1659%
59	0.3070%	0.1801%
60	0.3328%	0.1953%
61	0.3595%	0.2102%
62	0.3865%	0.2260%
63	0.4146%	0.2436%
64	0.4426%	0.2633%
65	0.4718%	0.2843%
66	0.5024%	0.3089%
67	0.5357%	0.3372%
68	0.5725%	0.3690%
69	0.6148%	0.4050%
70	0.6621%	0.4468%
71	0.7166%	0.4941%
72	0.7778%	0.5473%
73	0.8470%	0.6069%
74	0.9248%	0.6743%
75	1.0125%	0.7493%
76	1.1094%	0.8326%
77	1.2177%	0.9247%
78	1.3361%	1.0280%
79	1.4675%	1.1416%
80	1.6128%	1.2675%
81	2.1519%	1.6809%
82	2.8729%	2.2266%
83	3.8341%	2.9482%
84	5.1179%	3.9014%
85	6.8322%	5.1594%
86	9.1214%	6.8200%
87	10.2056%	7.7417%
88	11.3885%	8.7744%
89	12.6657%	9.9112%
90	14.0356%	11.1466%
Ref	#2723sb0x1	#2724sb0x1